Service manual

RC-750

Valid for RC-750 type and serial number: 410100-01

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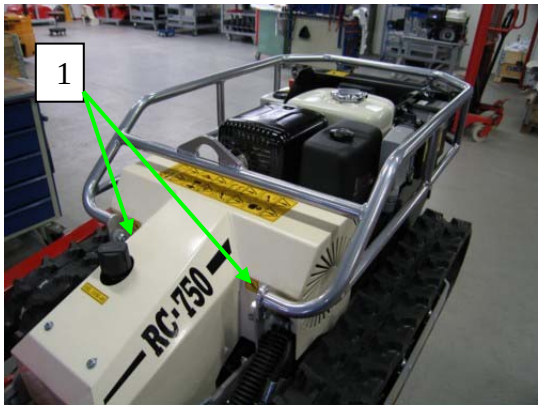
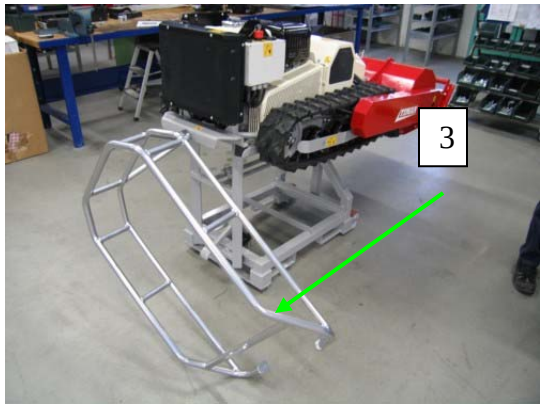
1 REMOVING GUARDS

1.1 Removing the branches protective guard

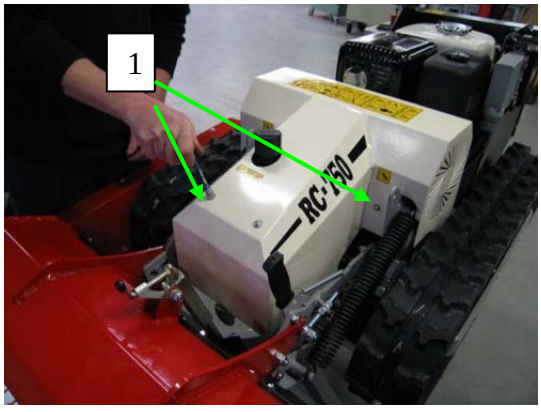
The protective guard is removed as follows:

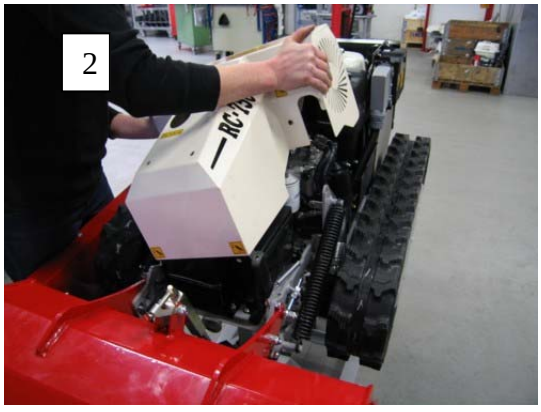


1. Loosen the screws holding the protective guard in the front part of the machine.
2. Tilt the protective guard backwards.
3. Tilt the protective guard around the centre of rotation on the rear part of the machine and lay it on the floor.



1.2 Removing the hydraulics guard

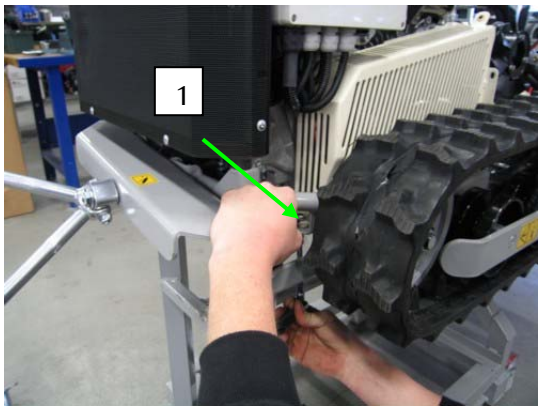


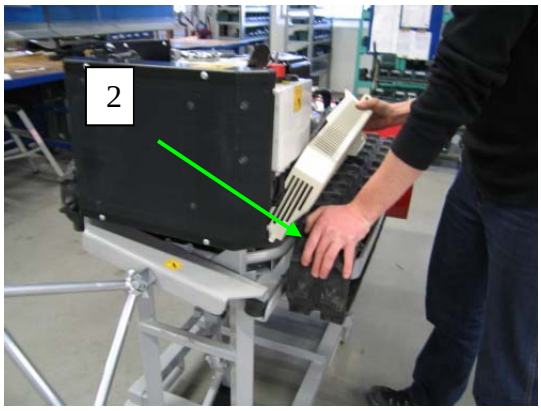


1. Loosen the six screws holding the guard.
2. Lift the guard directly up and remove it from the machine.

1.3 Removing the guard on the right side of the engine

First, remove the branches protective guard and the hydraulics guard, see sections 1.1, 1.2.

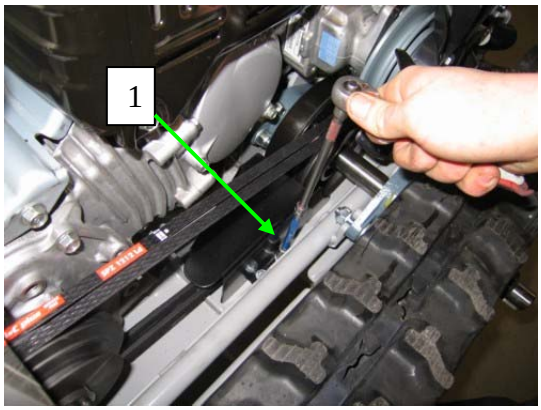


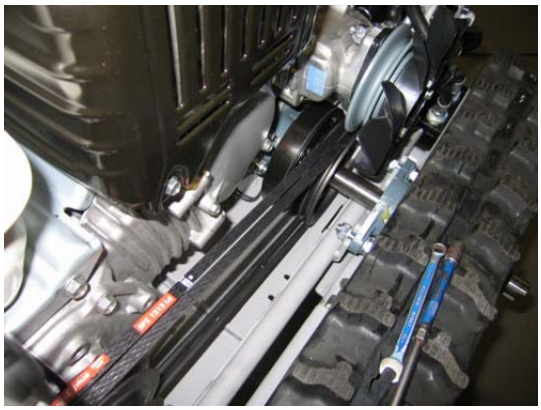


1. Loosen the rear screw.
2. Press the belt with the left hand and lift off the guard sideways.

1.4 Removing the black guard in front of the clutch

First, remove the branches protective guard, the hydraulics guard and the guard on the right side of the engine. See sections 1.1-1.3.

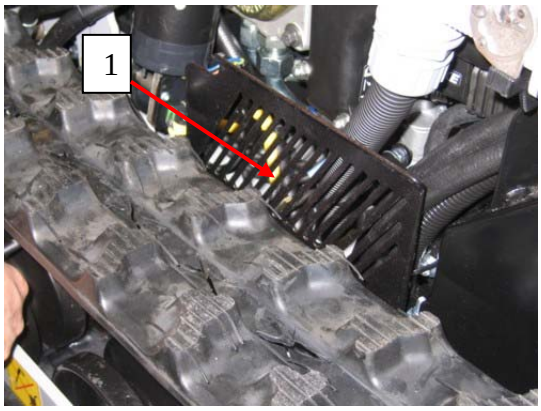


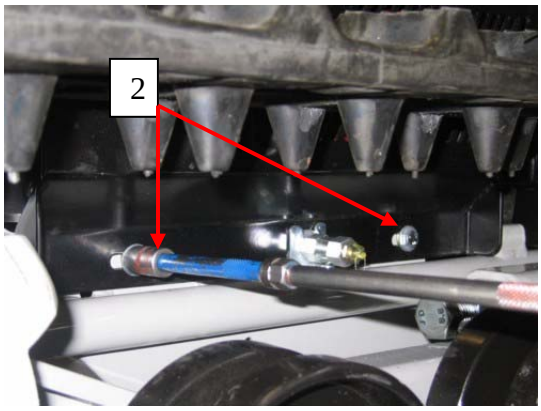


1. Loosen the three screws and then lift up the guard.

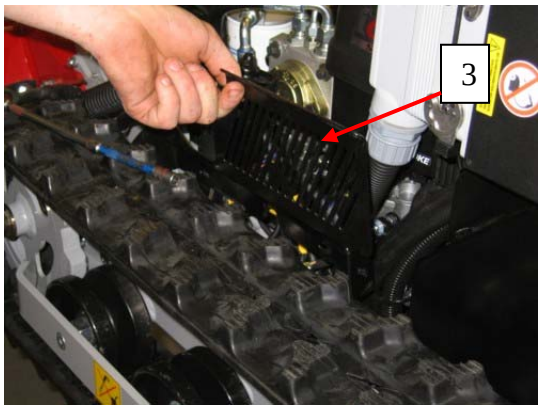
1.5 Removing the engine compartment guard

First, remove the branches protective guard and also the hydraulics guard. See sections 1.1, 1.2.

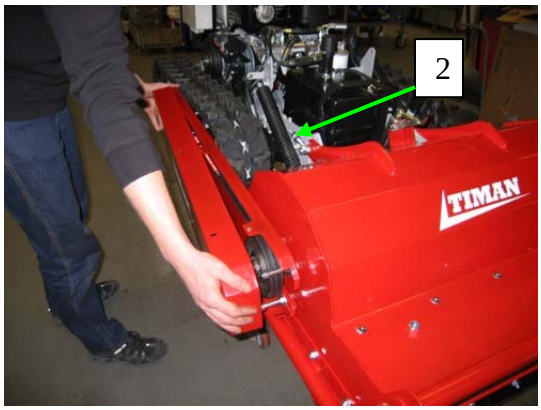




1. The guard on the right side.
2. Loosen the two screws between the belts.
3. Then lift up the guard.



1.6 Removing the mowing mechanism guard



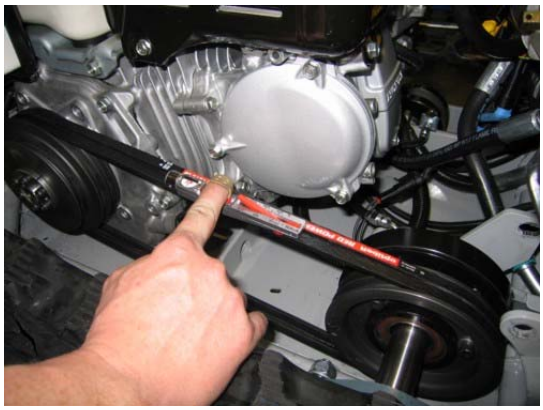
1. Loosen the six screws holding the guard, three on the upper side and three on the lower side.
2. Then remove the guard.

2 Propulsion system

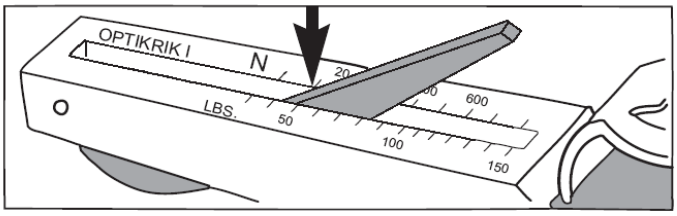
2.1 Tightening and maintenance of driving belts

To ensure that the belts are set and maintained correctly a belt tightening tester is supplied with the machine. Driving with belts that are too loose will considerably reduce the lifetime and efficiency of the belts and the driving pulleys will wear very quickly. If the belts are too tight, it will increase wear and tear on the machine bearings.
The belt tightening tester is used as follows:

1. Before you start measuring, turn the transmission several times to spread the tension across the entire belt.
2. Place the belt tightening tester between the driving pulleys and push the pointer to the scale.
3. Only use one finger to control the belt tightening tester.
4. Activate the tester slowly by increasing the pressure until you hear/feel a click after which do not exert pressure.
5. Remove the tester from the belt and read the tension in the intersection of the scale and the front part of the pointer.

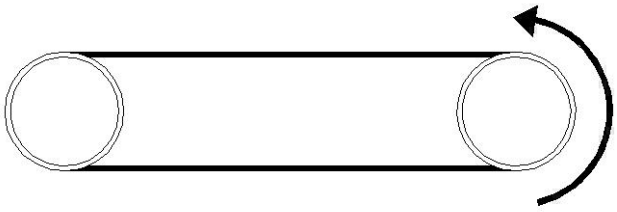


6. Continue setting the belt tension until the value measured and the value in the table below are equal. After each adjustment, turn the transmission several times to make sure that the belt tension near the driving pulley is the same as in the rest of the belt.



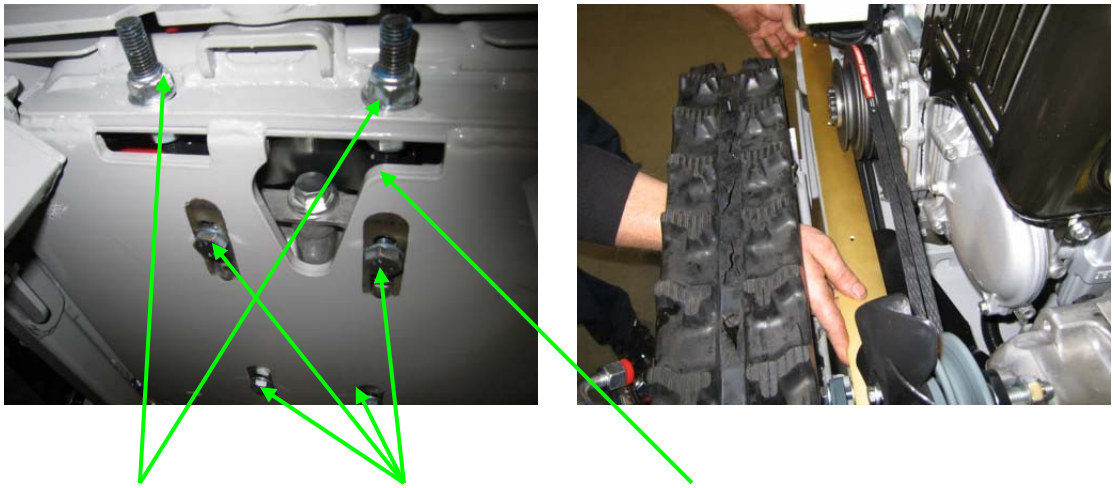
Static belt tension (N)	New belt	Used belt
Belts between the engine and clutch	375	300
Belts between the engine and pump	250	225
Belts between the clutch and mowing mechanism	375	300

Important: After tightening turn the transmission several times to spread the tension of the belt evenly.



2.2 Tightening the belts between the engine and clutch

First, remove the branches protective guard, the hydraulics guard and the guard on the right side of the engine. See sections 1.1, 1.2 and 1.3.



Belt tension adjusting nut

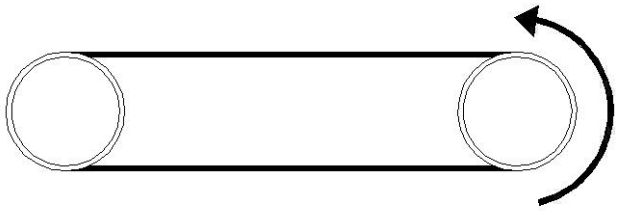
Location of the engine screws

Lock-nut

Tighten the belts as follows:

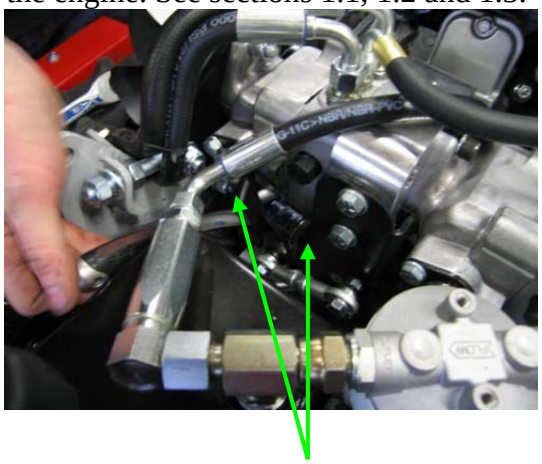
1. Loosen the four screws holding the engine.
2. Loosen the lock-nuts on the setting fitting.
3. Continue adjusting the lock-nuts until the belt tension is 375 N for a new belt and 300 N for a used belt.
4. Using the horizontal batten check whether the driving pulley of the engine is parallel to the clutch. If not, adjust the lock-nuts. Check the belt tension afterwards.
5. Tighten the screws of the engine and lock-nuts.

Important: After tightening turn the transmission several times to spread the belt tension evenly.

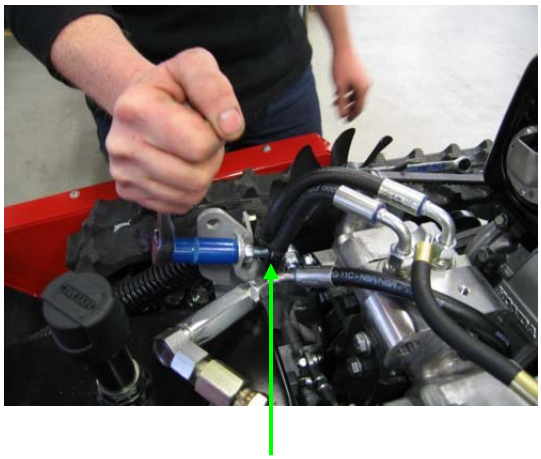


2.3 Tightening the belts between the engine and hydraulic pump

First, remove the branches protective guard, the hydraulics guard and the guard on the right side of the engine. See sections 1.1, 1.2 and 1.3.



Pump screws

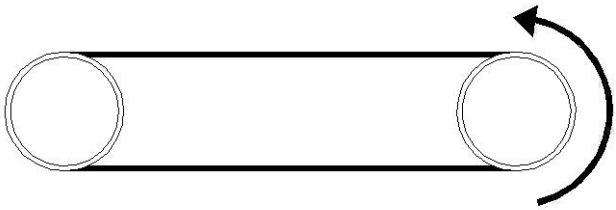


Adjusting screw

Tighten the belts as follows:

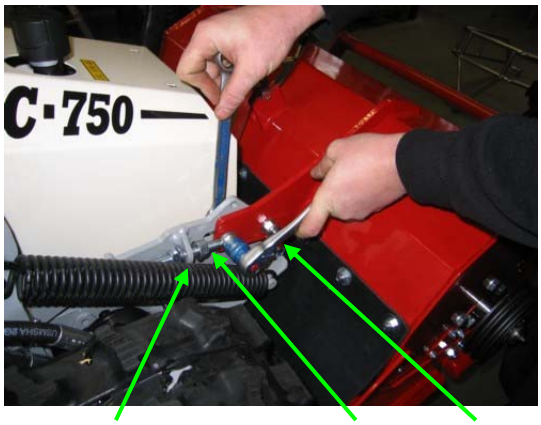
1. Loosen the two screws holding the pump.
2. Loosen the lock-nut of the adjusting screw.
3. Continue adjusting the adjusting screw until the belt tension is 250N for a new belt and 200N for a used belt.
4. Tighten the screws of the pump and lock-nuts.

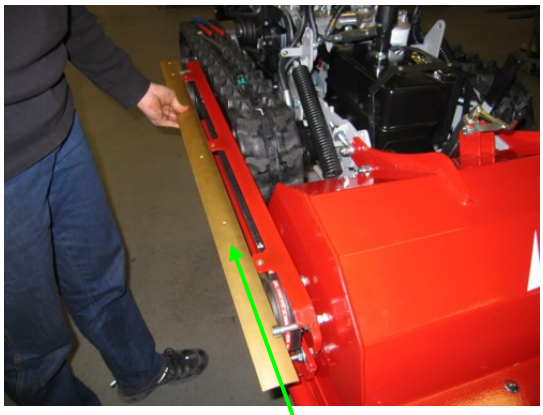
Important: After tightening turn the transmission several times to spread the belt tension evenly.



2.4 Tightening the belts between the clutch and mowing mechanism

First, remove the mowing mechanism guard. See section 1.6.



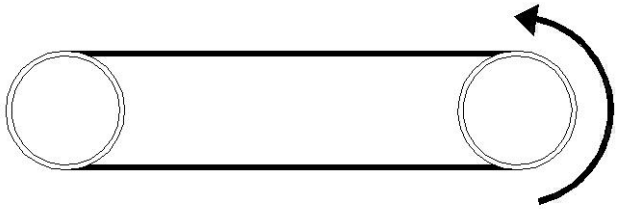


Adjusting screw Lock-nut Mowing mechanism screws Horizontal batten

Tighten the belts as follows:

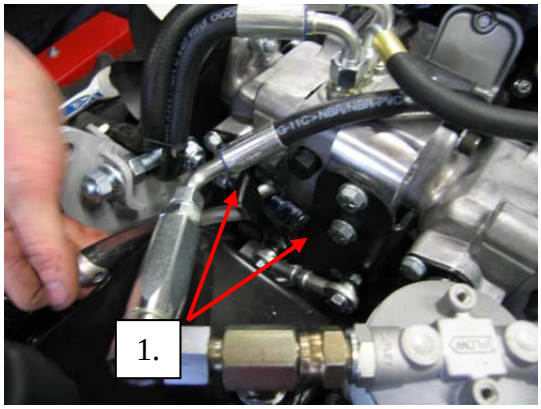
1. Loosen the four screws holding the mowing mechanism, two screws on each side.
2. Loosen the lock-nuts on the adjusting screws.
3. Continue adjusting the nut on the adjusting screw until the belt tension is 375N for a new belt and 300N for a used belt.
4. Using the horizontal batten, check whether the mowing mechanism driving pulley is parallel to the clutch. If not, adjust the nuts. Check the belt tension afterwards.
5. Tighten the screws of the mowing mechanism and also the nuts.

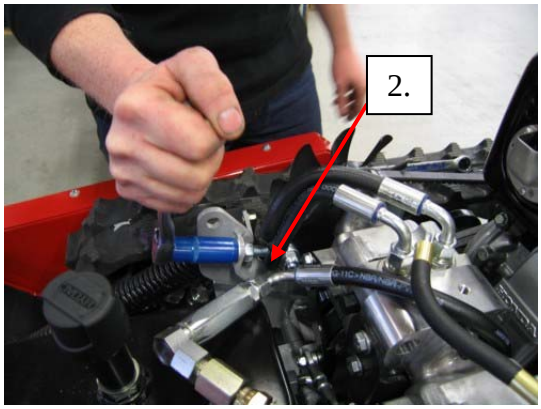
Important: After tightening turn the transmission several times to spread the belt tension evenly.

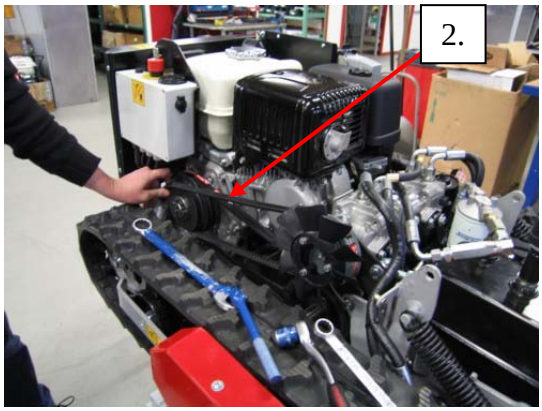


2.5 Replacing the belt between the engine and hydraulic pump

The belt is replaced as follows:
First, remove the branches protective guard, the hydraulic pump guard and the guard on the right side of the engine. See sections 1.1, 1.2 and 1.3.





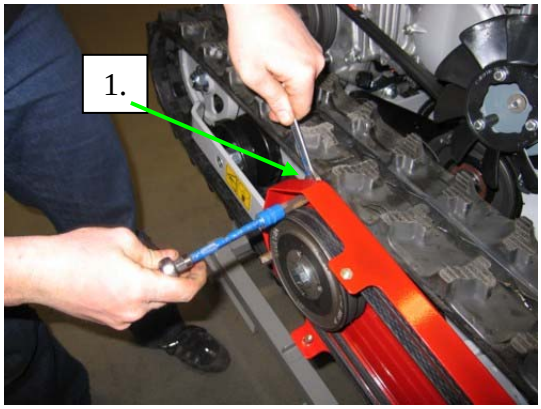


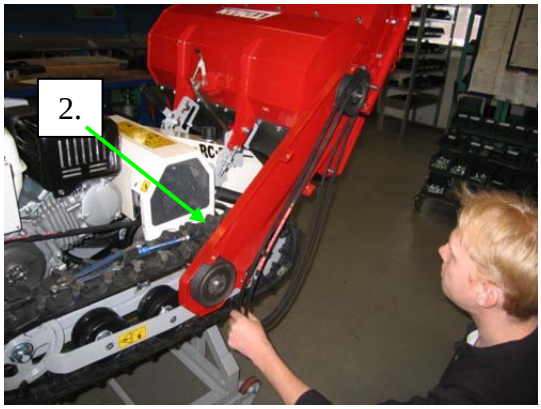
1. Loosen the two screws holding the pump.
2. Loosen the adjusting screw nut and tilt the pump towards the engine.
3. Now the belt can be removed.

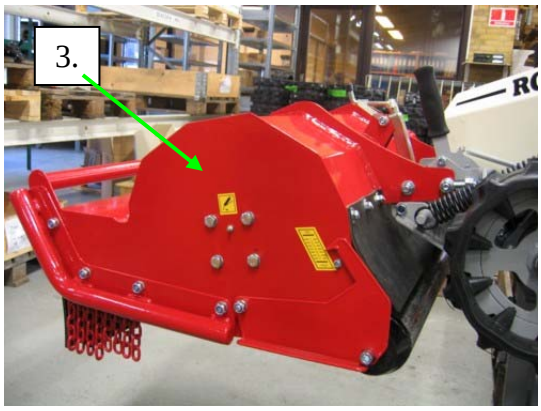
Assemble in the reverse order from removing. See section 2.3 for the correct belt tension.

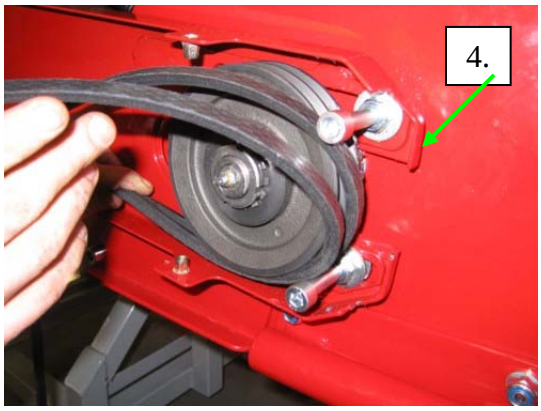
2.6 Replacing the belts between the clutch and mowing mechanism

The belts are replaced as follows:
First, remove the mowing mechanism guard. See section 1.6.







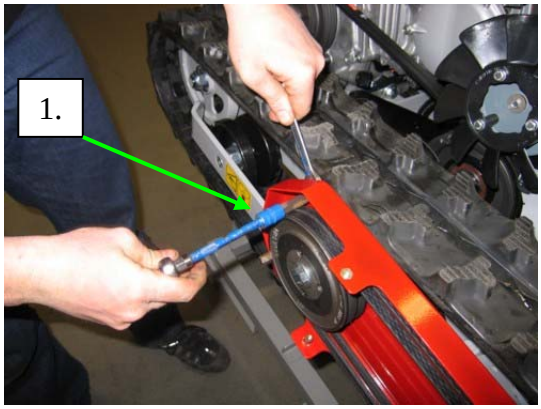


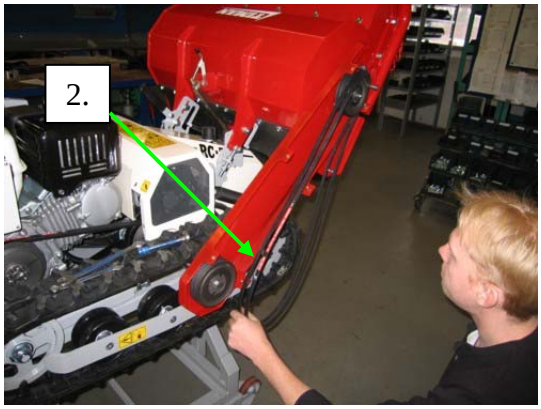
1. Remove the belt shaft.
2. Lift up the mowing mechanism to the service position and remove the belt.
3. Lift up the machine so that the mowing mechanism is in the lowest position.
4. Remove the mowing mechanism belts.

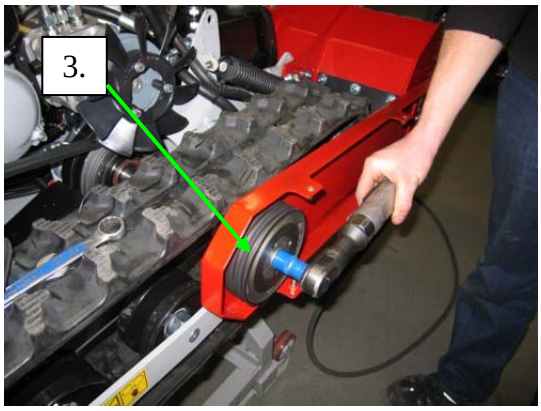
Assemble in the reverse order from removing. Tighten as in section 2.4.

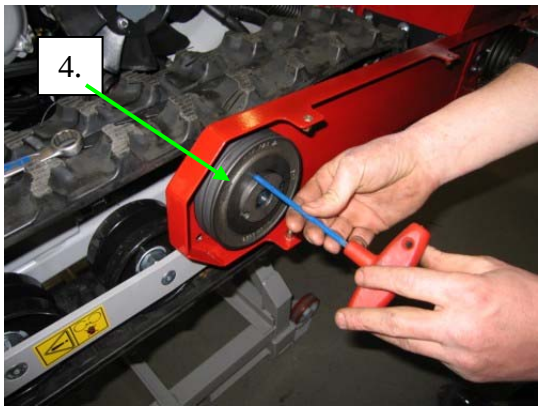
2.7 Replacing the belts between the engine and clutch

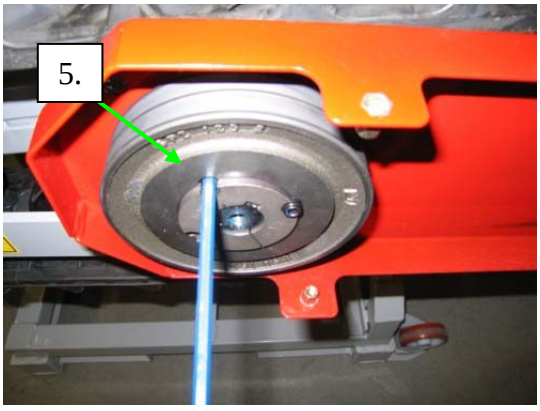
The belts are replaced as follows:
First, remove the branches protective guard, the hydraulic pump guard, the guard on the right side of the engine, the guard in front of the clutch and the mowing mechanism guard, see sections 1.1, 1.2, 1.3, 1.4 and 1.6.

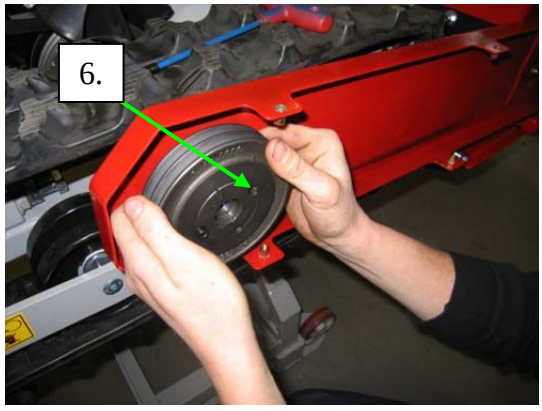






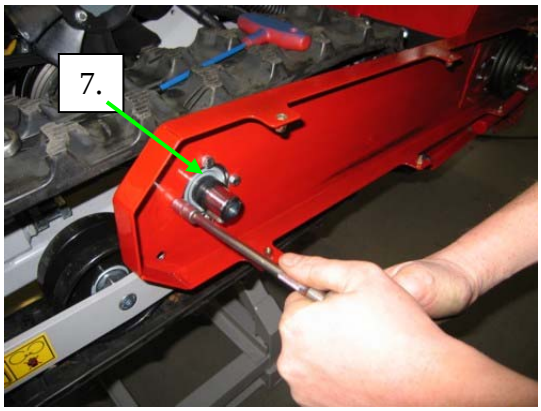


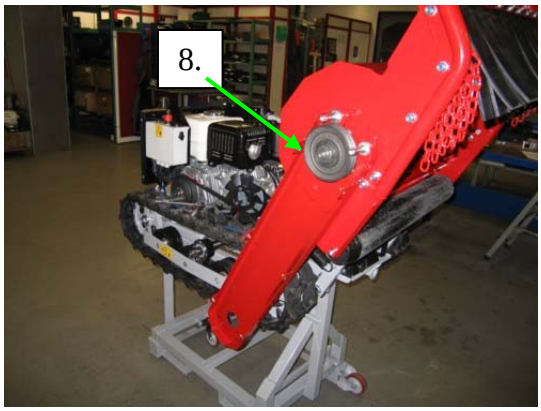


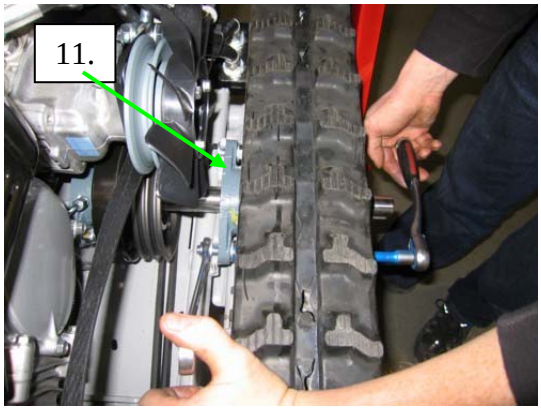


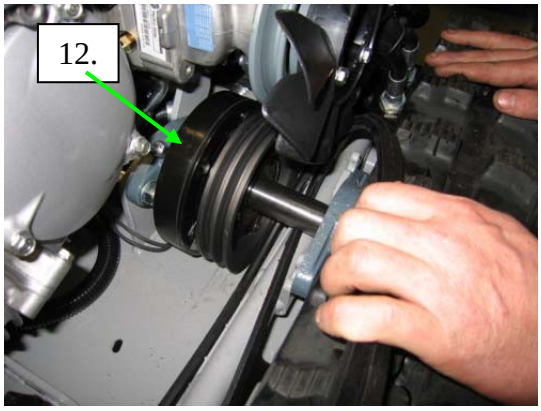
1. Remove the belt shaft.
2. Lift up the mowing mechanism to the service position and remove the belt from the driveshaft.
3. Remove the driving pulley screw. Use the impact wrench.
4. Loosen the two hexagon screws in the Taper Lock case.

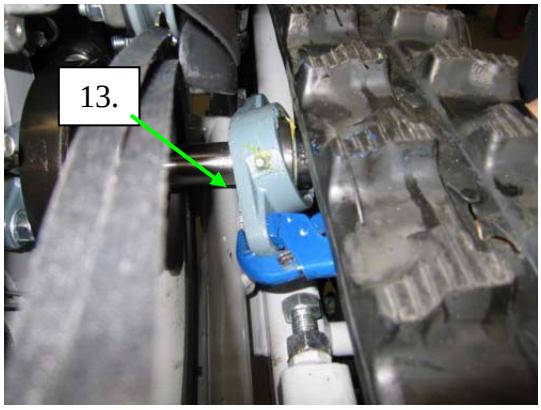
5. Screw the hexagon screw to the free thread. Tighten the screw to remove the V-belt driving pulley and the Taper Lock case.
6. Remove the V-belt driving pulley and the Taper Lock case.

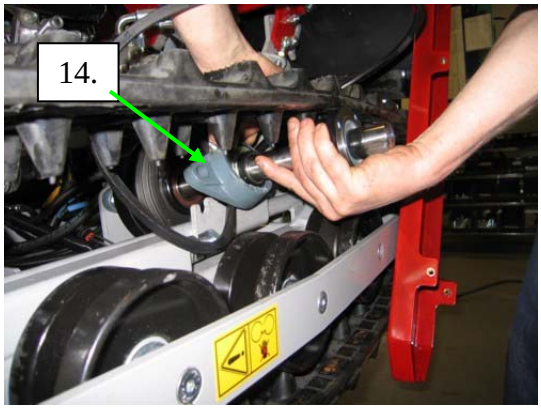






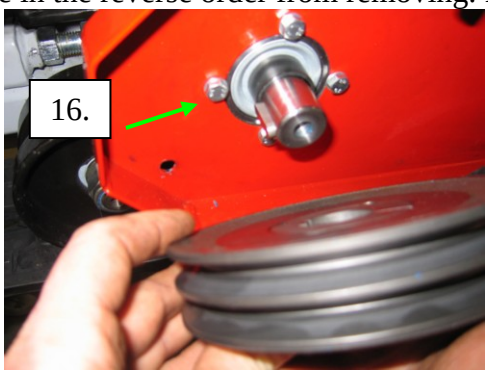






7. Unscrew the four belt guard screws and remove the guard from the shaft.
8. Lift up the mowing mechanism to the service position.
9. Remove the hydraulic pump belt. See section 2.5.
10. Loosen the engine and set it to the adjusting screws so that the belts are loose. See section 2.2 on tightening belts between the clutch and engine.
11. Loosen the two screws holding the most rearward flange bearing.
12. Pull out the belt from the clutch driving pulley and lay it towards the chassis.
13. Turn the flange bearing approximately 25 degrees using a wrench.
14. Turn the shaft upwards and remove the belts. If the belt is too tight, it is better to loosen it before you lift up the shaft. See section 4.1.

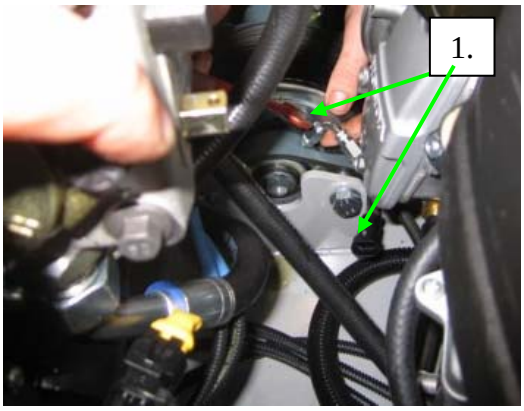
Assemble in the reverse order from removing. Please note the following:

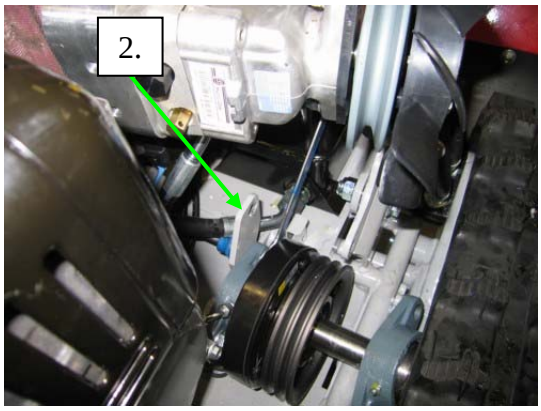


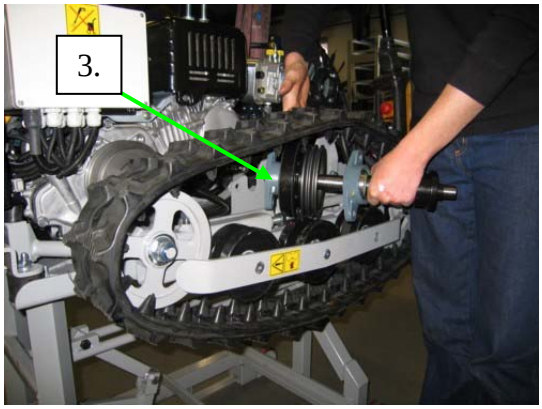
15. Tighten the belt as shown in section 2.2.
16. The screws holding the guard must be treated with Loctite (thread securing).
17. The central screw holding the Taper Lock case must be tightened before tightening the hexagon screws in the driving pulley. The screw holds the internal bearing ring of the guard in place. The screw must be treated with Loctite (thread securing). The hexagon screws are tightened to 20 NM.

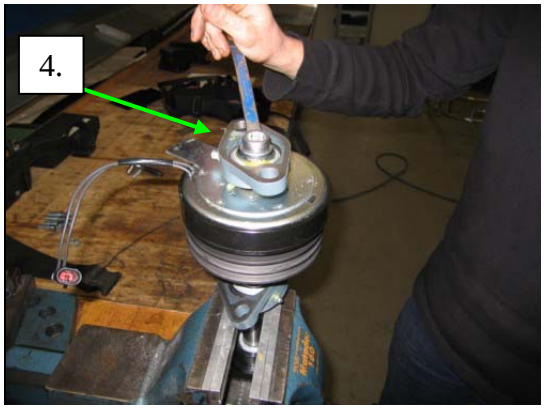
2.8 Replacing the clutch and flange bearings

The clutch and bearings are replaced as follows:
Follow the instructions for replacing the belts between the clutch and engine up to and including point 11. See section 2.7.
Follow the instructions for replacing the servo-engine up to and including point 8. See section 9.1.

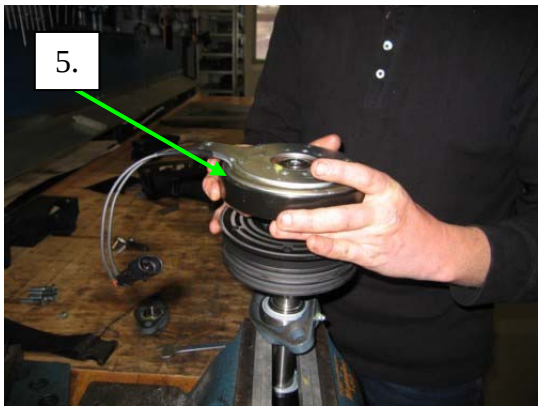


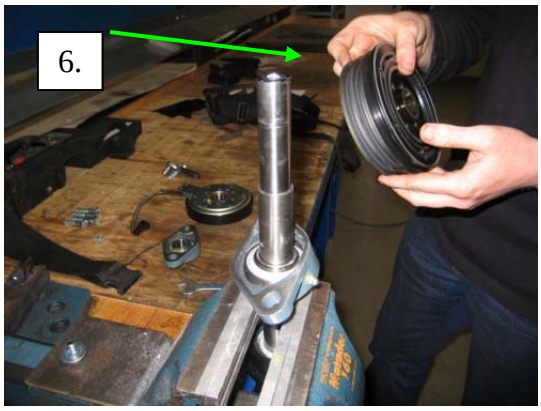


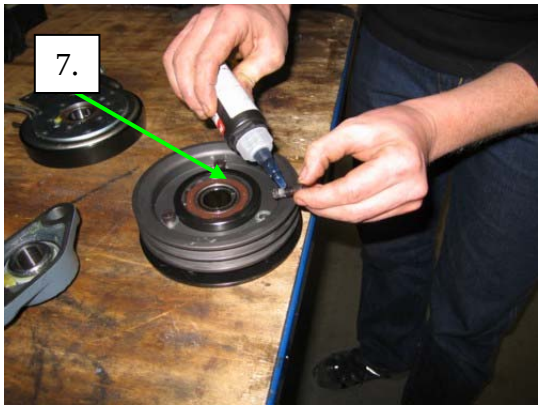


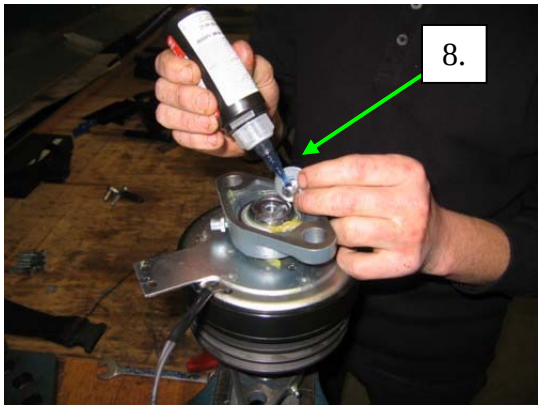


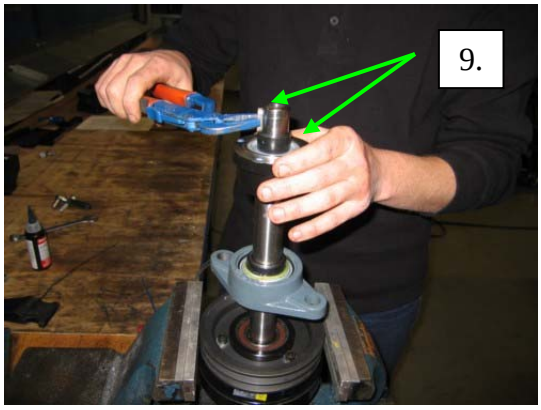
1. Remove the electric connection of the clutch and the lubricating hose of the flange bearing.
2. Loosen the two screws holding the inner flange bearing, use a socket wrench with a long extension.
3. Loosen the belt, see section 4.1. Lift up the belt and pull out the clutch from the machine at the same time.
4. Fix the clutch in a vice, loosen the screw holding the flange bearing and remove the bearing.

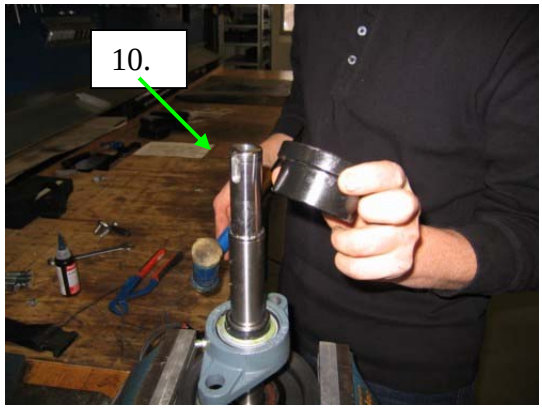




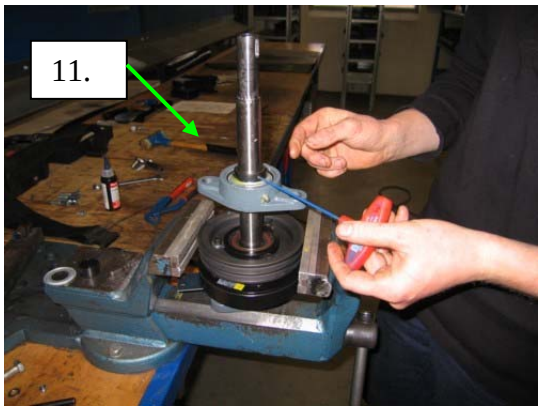


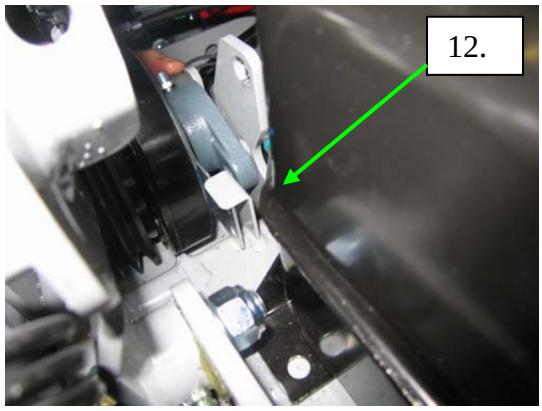






5. Remove the clutch coil.
6. Remove the driving pulley and claw clutch.
7. When assembling the driving pulley the screw must be treated with Loctite (thread securing).
8. When assembling the screw holding the flange bearing treat the screw with Loctite (thread securing).
9. Remove the groove and distance ring.
10. Remove the guard bearing case.





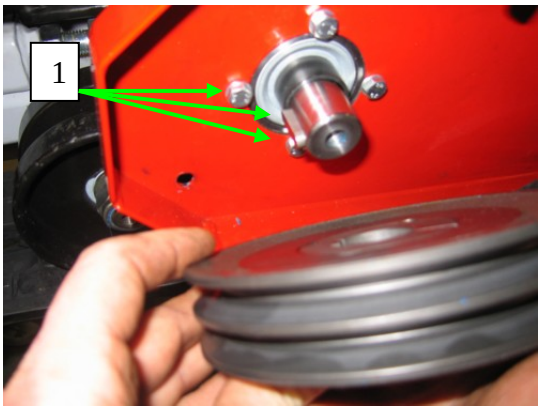
11. Loosen the setscrews on the flange bearing and remove the bearing.

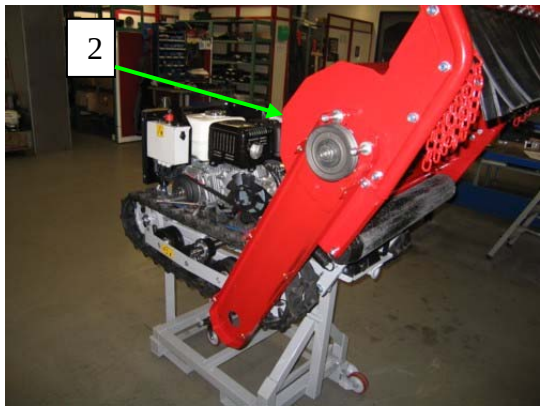
Assemble in the reverse order from removing. Please note the following:

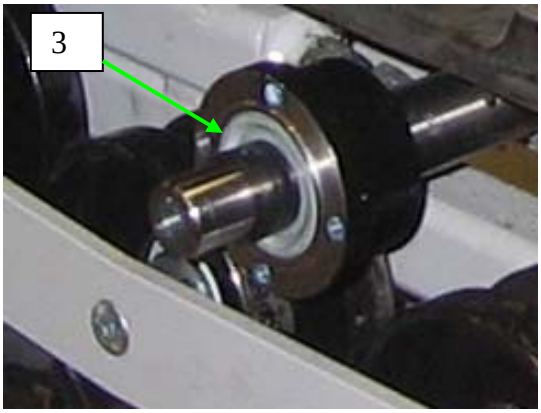
12. When installing the clutch on the machine make sure that the force arm of the clutch is in the lock of the machine.
13. The setscrews of the bearing can be tightened after the screws holding the flange bearings are tightened.

2.9 Replacing the guard bearing

The guard bearing is replaced as follows:
Follow the instructions for replacing the belts between the clutch and engine up to and including point 6. See section 2.7.

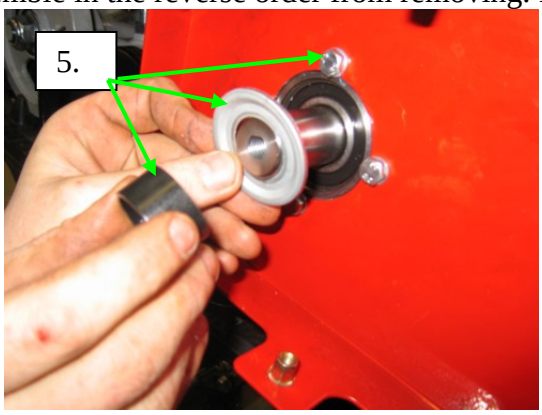






1. Remove the four guard screws and the distance ring and groove.
2. Pull out the guard above the shaft and place the mowing mechanism in the service position.
3. Pull out the bearing sleeve from the shaft using the shaft clamp.
4. Remove the lock ring and Nilos ring, then remove the bearings from the bearing sleeve and mount the new bearings.

Assemble in the reverse order from removing. Please note the following:

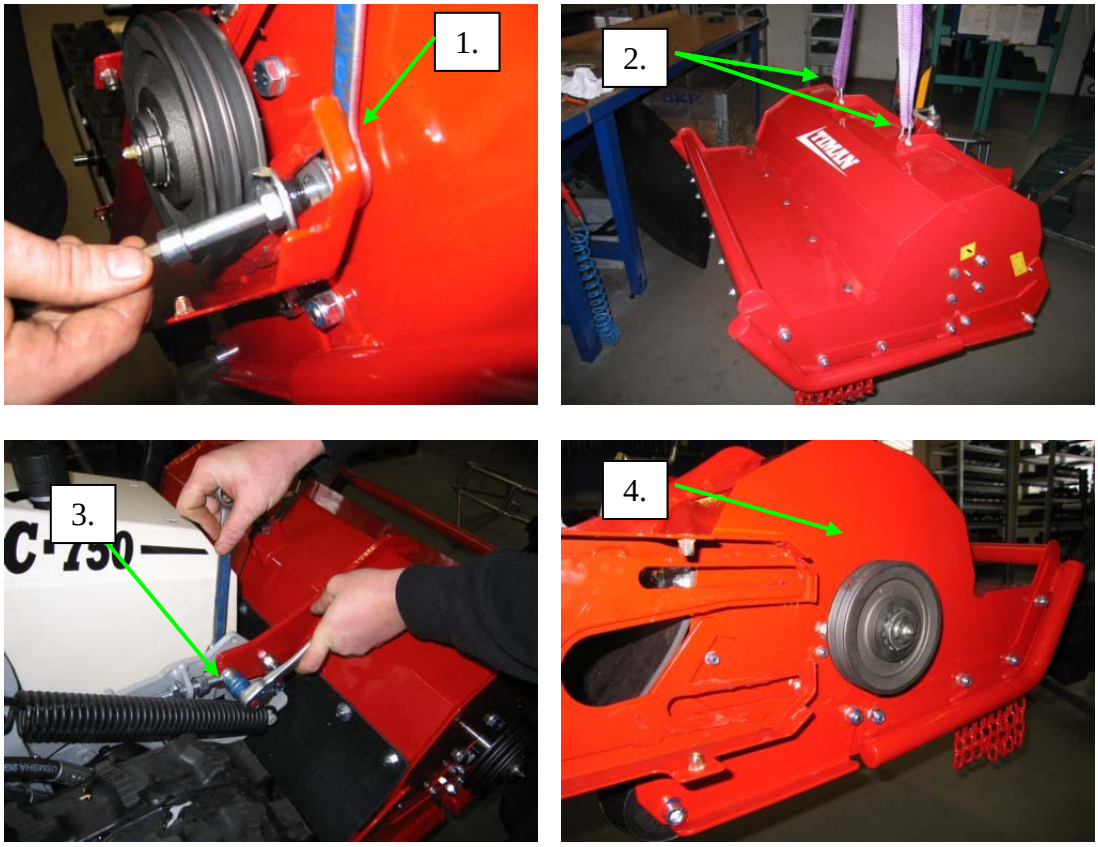


5. The screws holding the guard must be treated with Loctite (thread securing), the assembly of the Nilos ring and distance ring is shown in the picture.
6. The central screw holding the Taper Lock case must be tightened before tightening the hexagon screws in the driving pulley. The screw holds the internal bearing ring of the guard in place. The screw must be treated with Loctite (thread securing). The hexagon screws are tightened to 20 NM.
7. Tighten the belt according to section 2.4.

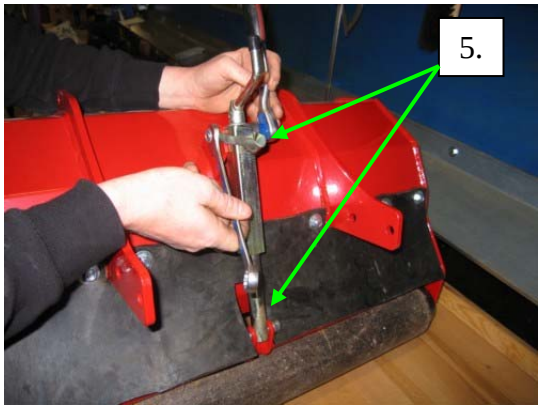
3 MOWING MECHANISM

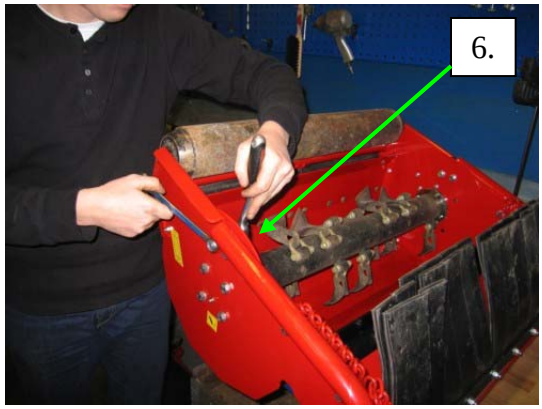
3.1 Removing the flail axis

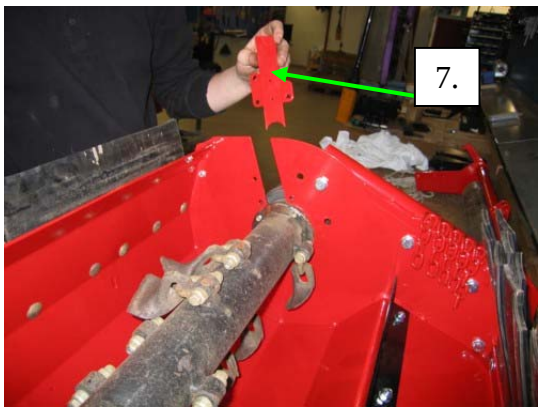
The flail axis is removed as follows:
First, remove the mowing mechanism protective guard, see section 1.6, and follow the instructions for removing the belt described in section 2.6.

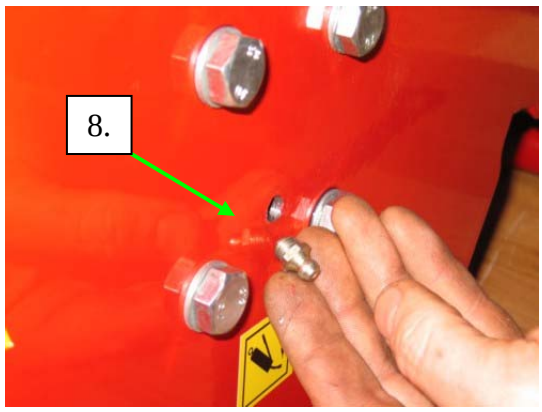


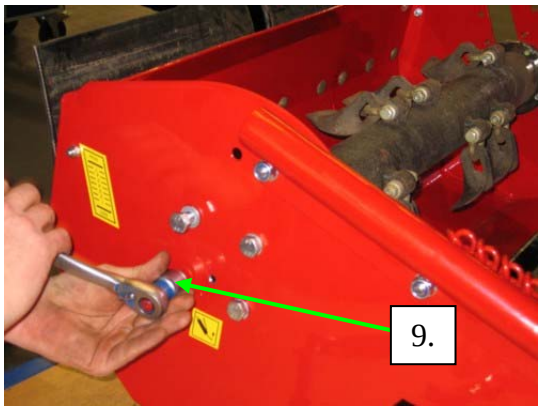
1. Remove the two screws of the inner guard, note the distance ring between the two washers of the screw.
2. Mount two approved lifting hangers to the lifting eyes on the mowing mechanism.
3. Loosen and remove the two setscrews of the mowing mechanism and also the four screws holding the mowing mechanism.
4. The mowing mechanism can now be unfastened from the arms and inner guard.

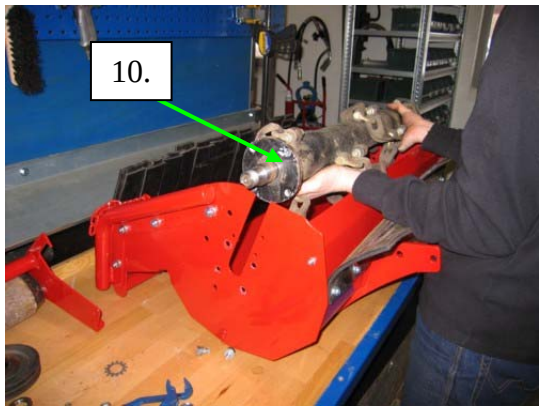








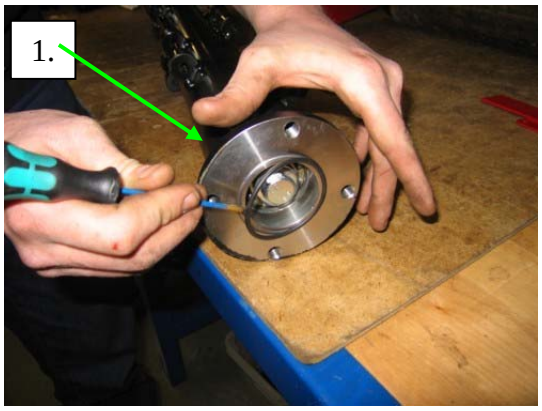


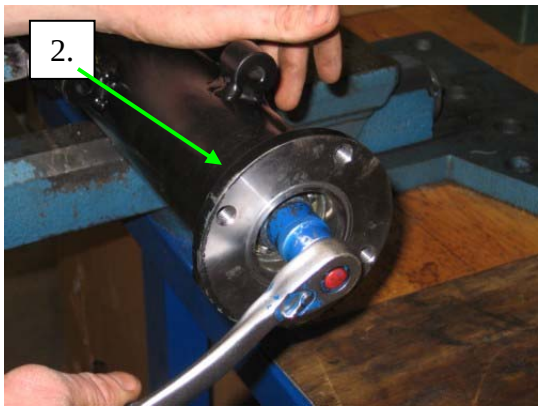


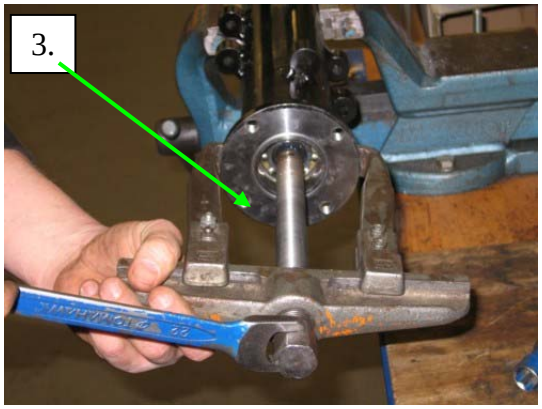
5. Remove the vertical positioning shaft.
6. Remove the chain pulley holder.
7. Loosen the three screws holding the closing plate and remove the plate.
8. Remove the lubricator on the left side of the mowing mechanism.
9. Remove the bearing sleeves screws on the right and left side of the mowing mechanism.
10. Lift up the flail axis from the shield of the mowing mechanism.

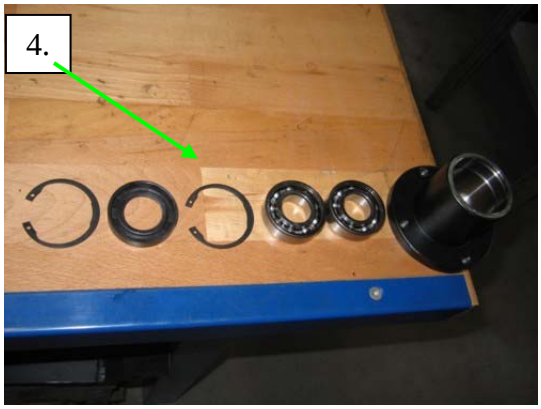
3.2 Replacing the bearings in the flail axis

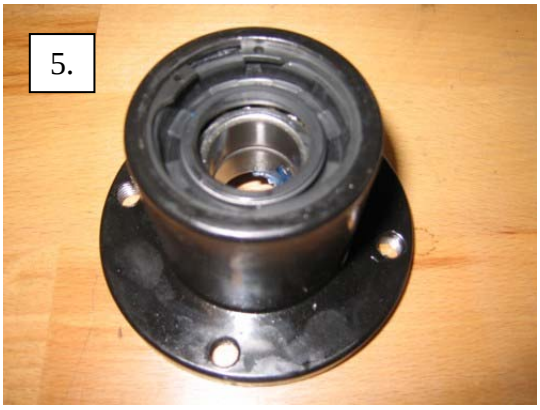
The bearings on the left side are replaced as follows:

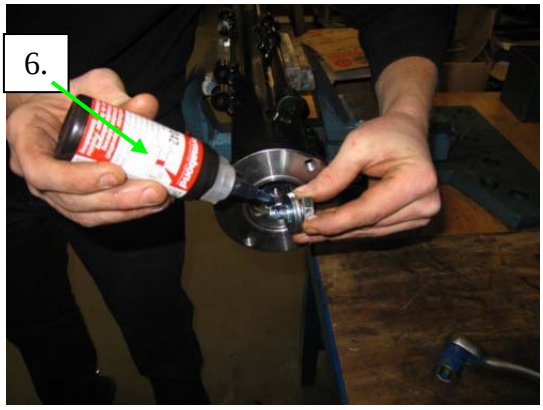






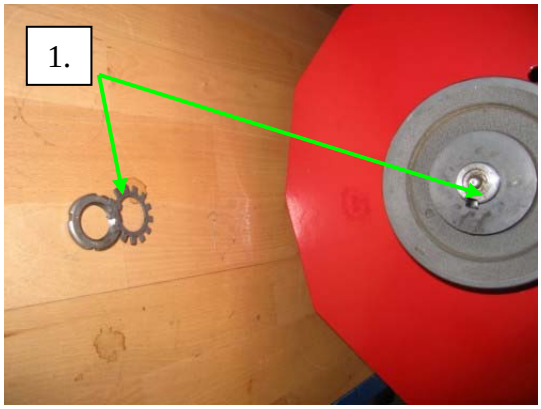


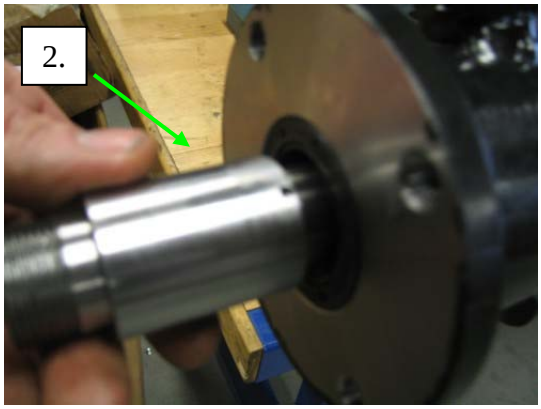


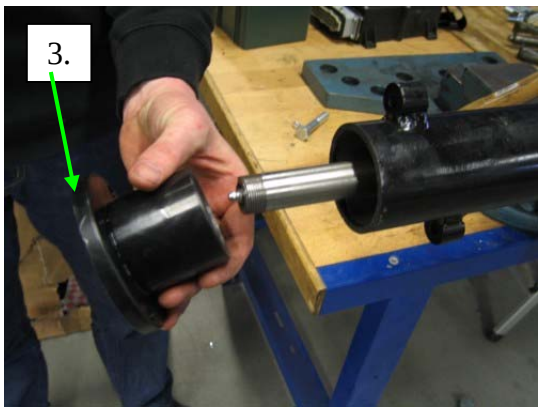


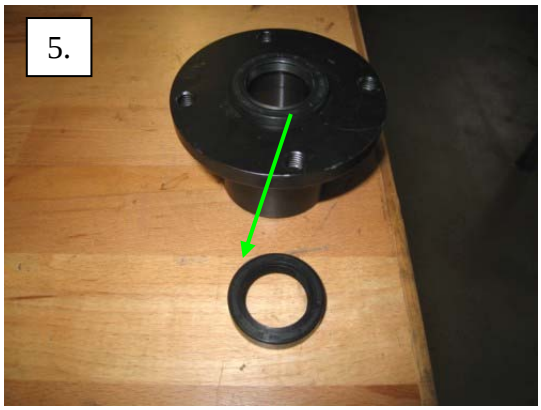
1. Note the O-ring on the left side of the bearing sleeve which keeps water outside the bearings.
2. Loosen the nut holding the bearing.
3. Remove the bearing sleeve using the clamp.
4. Replace the bearings and mount them according to the pictures, start with the bearing on the right.
5. Make sure that the oil seal ring is turned according to the pictures. When mounting use a special jack because otherwise the oil seal ring might be damaged.
6. When mounting make sure the screw is treated with Loctite (thread securing).

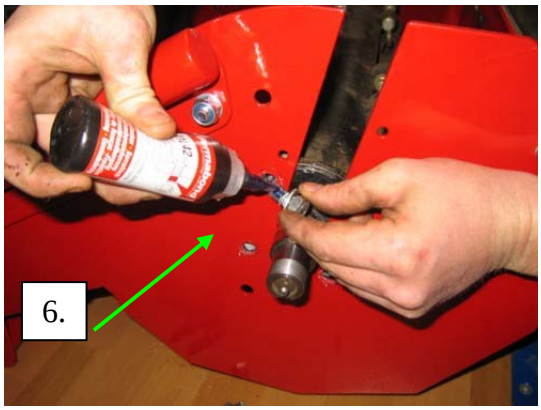
The bearings on the right side of the flail axis are replaced as follows:











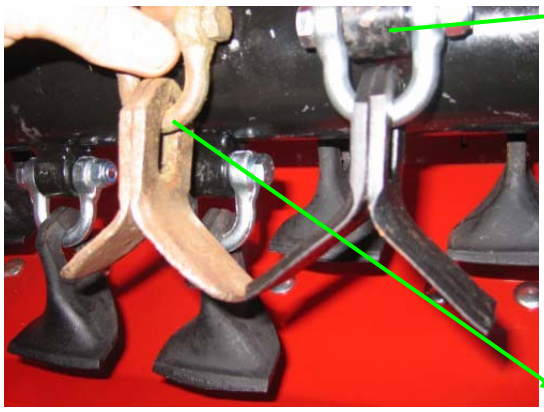
1. Remove the nut, self-locking washer and driving pulley.
2. Remove the distance tube, note that the oil hole faces towards the bearings.
3. Remove the bearing sleeve using the clamp.
4. Replace the bearings and mount them according to the pictures, start with the bearing exactly on the right. The oil seal ring must be oriented according to the picture on the previous page.
5. Turn the bearing sleeve and mount the oil sleeve ring.
6. Assemble in the reverse order from removing. Please note the following:

7. When mounting the flail axis the eight screws holding the bearing sleeve must be treated with Loctite (thread securing).

3.3 Flail cutters, hangers and screws

The machine can have two types of flail cutters: Y-shaped cutters or hammer flail cutters. When servicing check the following:

- The number of Y-shaped cutters is 32 and the number of hammer flail cutters is 16.
- The flail axes hangers must rotate freely.
- If the cutters show signs of wear and tear replace them.



Case

Where the hanger will wear

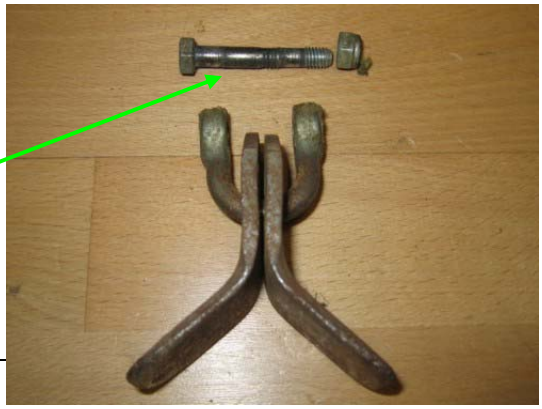
The picture shows a new and used Y-shaped flail cutter.
When replacing check the wear and tear of the hanger where the cutter is suspended. If the hanger is worn, replace it.
When replacing the flail cutter always replace the screw and nuts on which the hanger is suspended.

The picture shows a new and used hammer flail cutter.
When replacing check the hangers. Replace the screws and nuts.

Replace the flail cutters before they are completely worn-out, new flail cutters mow better. Adjust the mowing height according to the conditions and never allow the flail cutters to touch the ground.

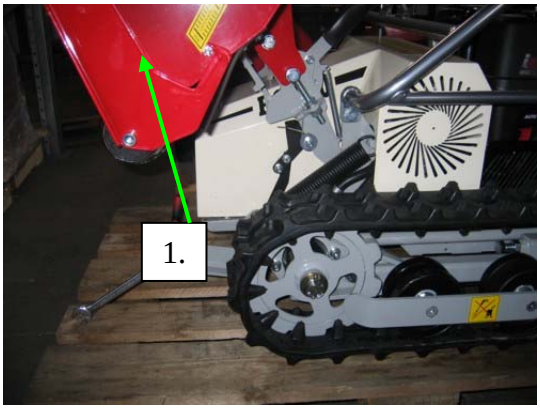
Important: When replacing flail cutters all cutters must be replaced otherwise the flail axis will be unbalanced.
When replacing the flail cutters always replace the screw and nuts.

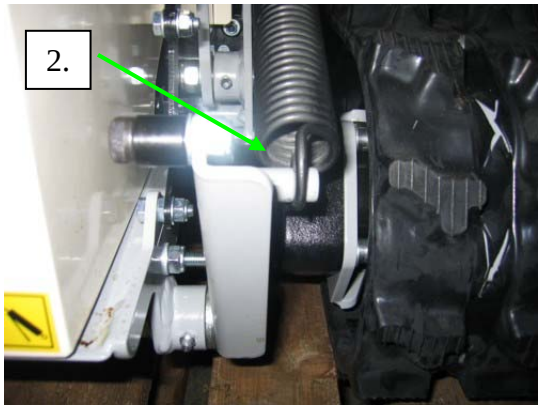
Worn out screw which must be replaced

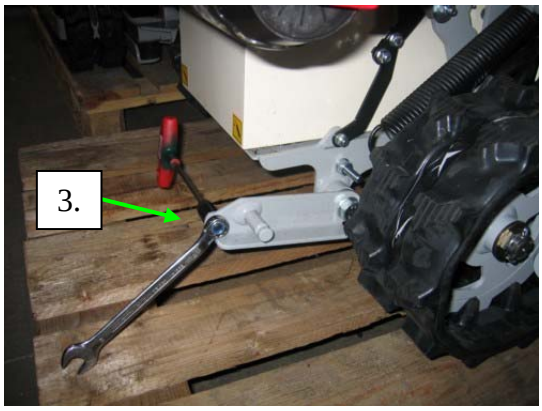


3.4 Replacing the cases of supporting arms

Cases are replaced as follows:





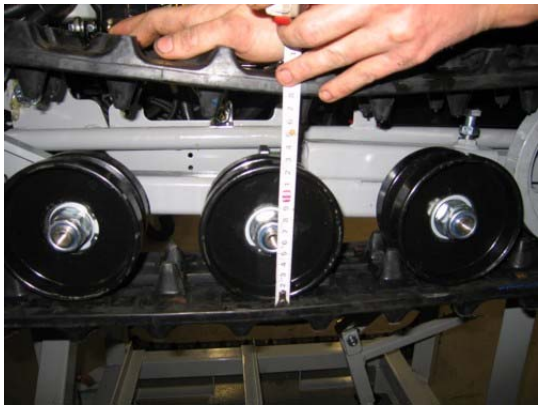


1. Put the mowing mechanism into the service position.
2. Remove the springs of the supporting arms.
3. Replace the cases.

4 Belts

4.1 Belts tension

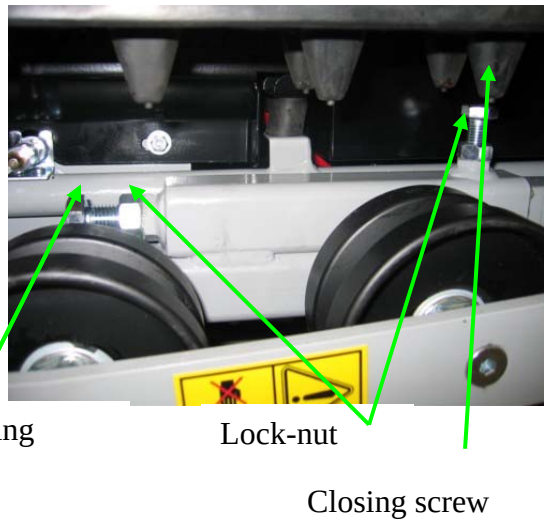
To measure if the belts of the machine are adjusted correctly, use a tape measure placed in front of the central chain pulley and measure approx. 210 mm. Push the upper side of the belt above the central chain pulley and measure the value on the tape. The value of a correctly tightened belt is 180 mm.



If the belt is too loose, adjust it as follows:

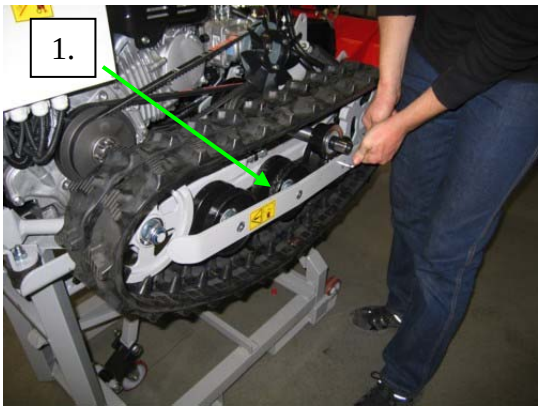
1. Loosen the lock-nuts.
2. Loosen the rear closing screw.
3. Tighten the belt by screwing the adjusting screw inside.

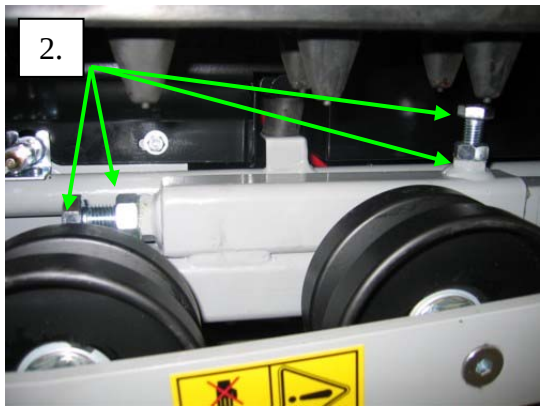
After adjusting and checking the belt tension, tighten the closing screw and lock-nuts.

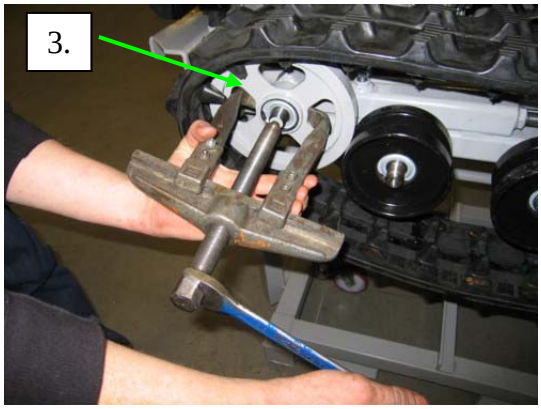


4.2 Replacing Belts

Belts are replaced as follows:
To replace the belts on the right side follow the instructions for replacing the belt between the engine and clutch up to and including point 8. See section 2.7.







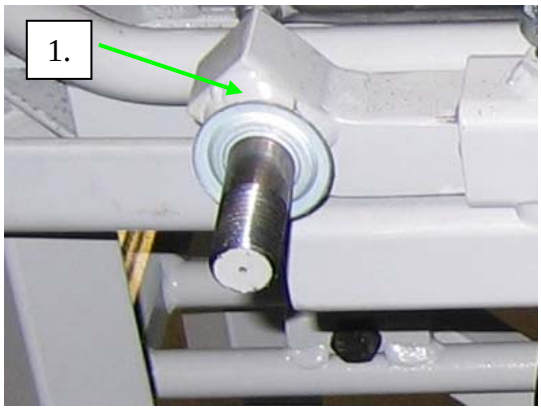
1. Remove the guard.
2. Loosen the two lock-nuts and unscrew the adjusting screws to remove tension from the belt.
3. Loosen the nut and remove the return pulley using the clamp.
4. Now the belt can be removed.

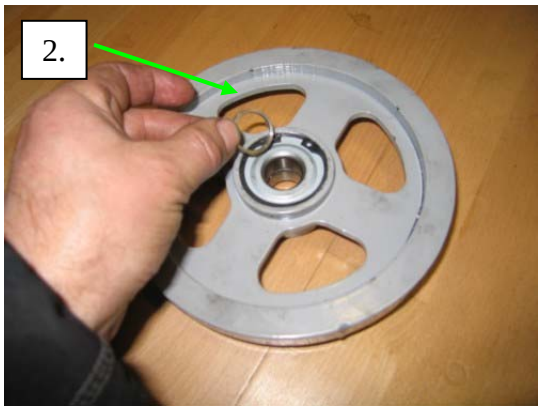
Assemble in the reverse order from removing.

When assembling pull the belt backwards and push the return pulley over the shaft at the same time.

4.3 Replacing the bearings in the return pulley

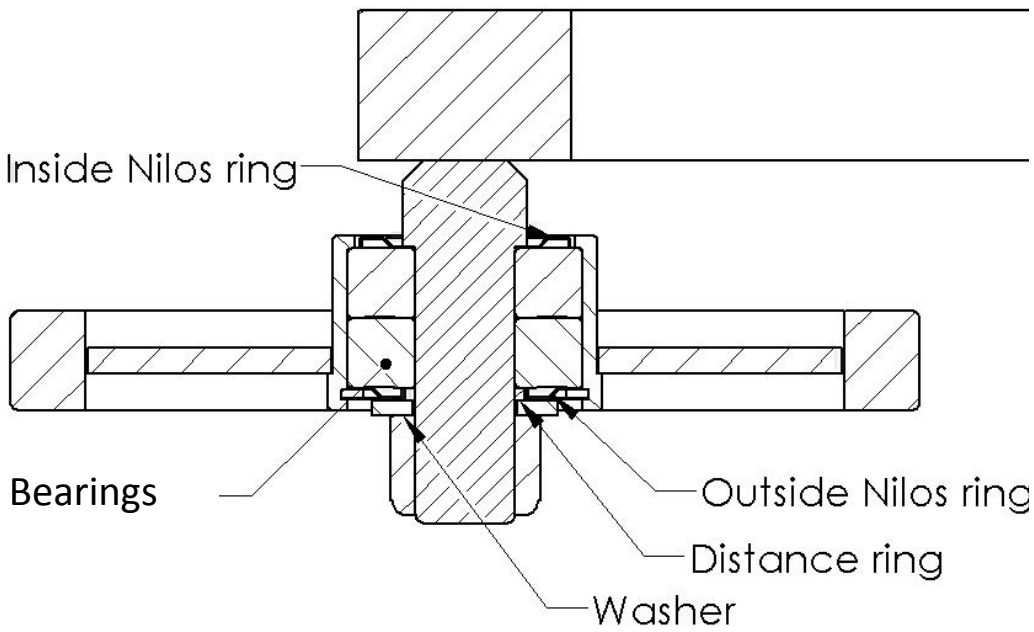
Remove the return pulley according to section 4.2.





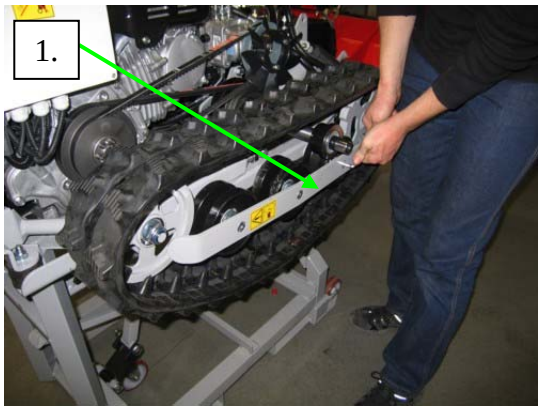
1. When replacing the bearings it is also important to replace the Nilos rings.
2. Now the bearings can be replaced. When mounting, be careful that the Nilos ring does not lay on the edge of the lock ring groove. After the pulley is mounted on the machine, do not forget to mount the distance ring otherwise the washer will damage the Nilos ring.

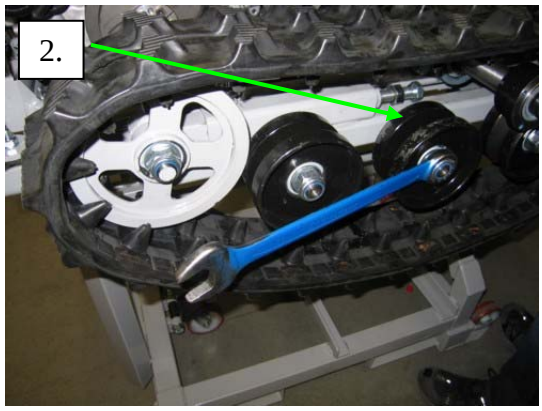
The picture shows a cross-section of the bearing structure with the pulley mounted on the machine.

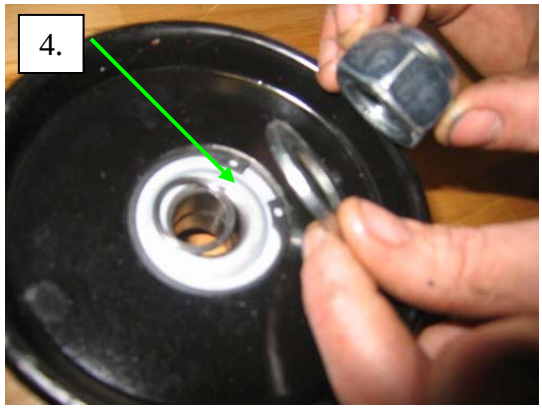


4.4 Replacing the bearings in the bearing pulley

The bearings are replaced as follows:



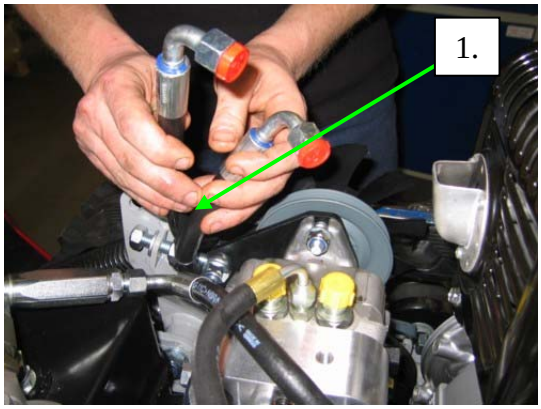


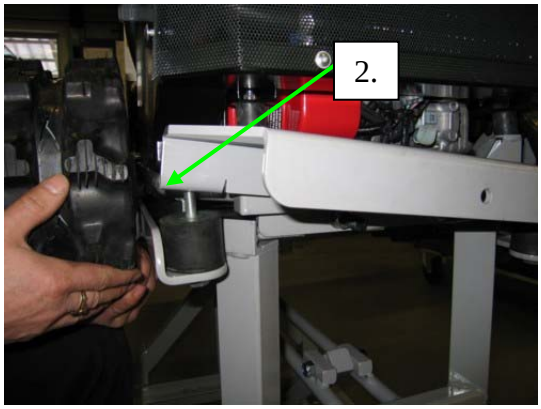


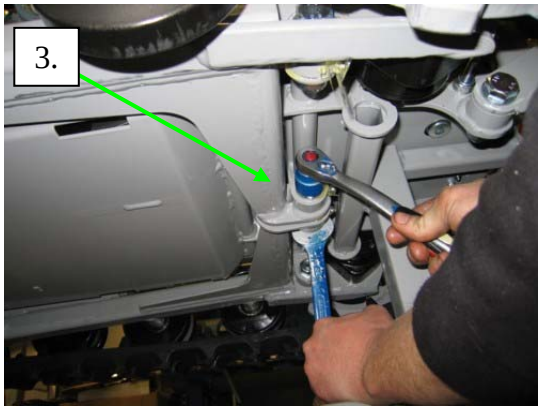
1. Remove the guard.
2. Loosen the bearing pulley nut.
3. Pull out the bearing pulley from the shaft using the clamp.
4. Now the bearings can be replaced. When mounting, be careful that the Nilos ring does not lay on the edge of the lock ring groove. After the pulley is mounted on the machine, do not forget to mount the distance ring otherwise the washer will damage the Nilos ring. See the picture of the bearing structure on the previous page.

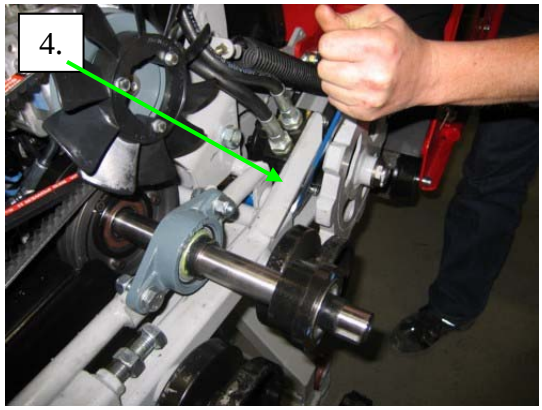
4.5 Replacing the hydraulic wheels motor

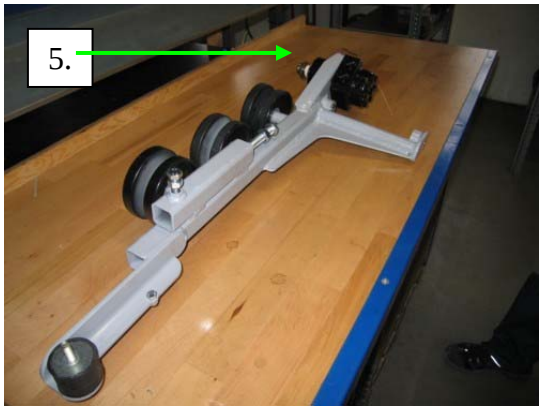
The hydraulic wheels motor is replaced as follows:
First, remove the branches protective guard, the hydraulics guard and the mowing mechanism guard, see sections 1.1, 1.2, 1.6. Follow the instructions for replacing belts up to and including point 4, see section 4.2.











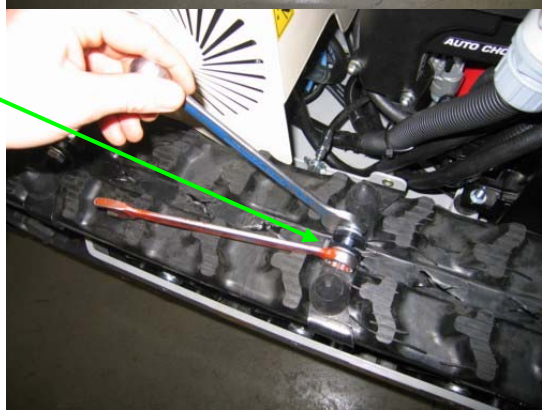
1. Remove the hydraulic hoses of the pump. Block the hoses and fittings.
2. Remove the nut of the rubber shock absorber.
3. Remove the central screw on the lower side of the chassis.
4. Loosen the driving wheel screw. Lift up the belt hanger from the machine.
5. Remove the driving wheel using the clamp and then remove the wheels motor.

Assemble in the reverse order from removing but make sure the belt hanger is parallel to the chassis before tightening the screws [3] and [4]. When removing the belt hangers it is recommended to replace the cases in the tipping section.
When mounting the new wheels motor the screws holding the engine must be treated with Loctite (thread securing).

4.6 Spikes assembly

Spikes are mounted between every fourth pattern on the belt, see the picture. See the picture.

Push the fitting inside and tighten the screw.



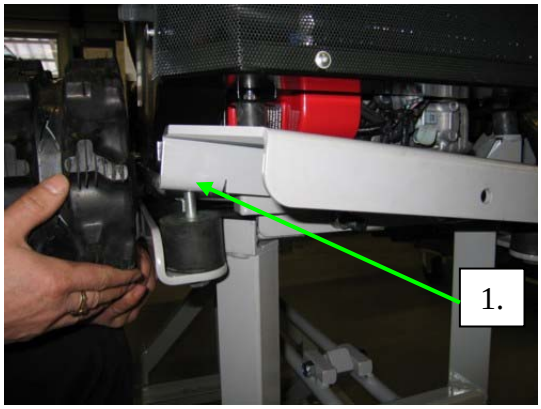
A set of spikes includes the following:

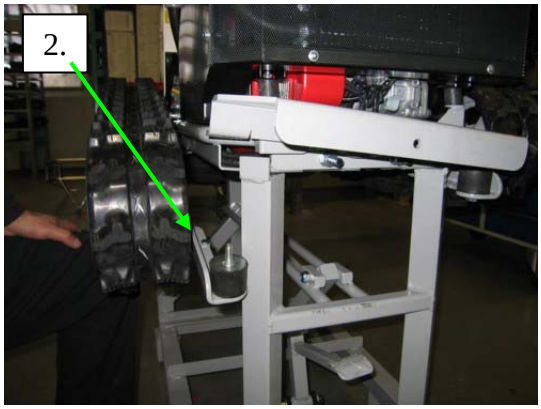
- 14 inner spikes with fittings
- 14 outer spikes with fittings
- 14 M10x25 screws
- 28 M10 washers
- 14 M10 closing nuts

5 RUBBER BELT HANGERS

When servicing carefully check the rubber shock absorbers for cracks and other damage.

The rubber hangers of the triangle are replaced as follows:

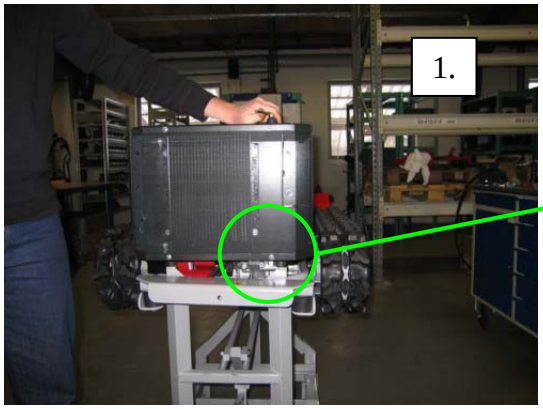


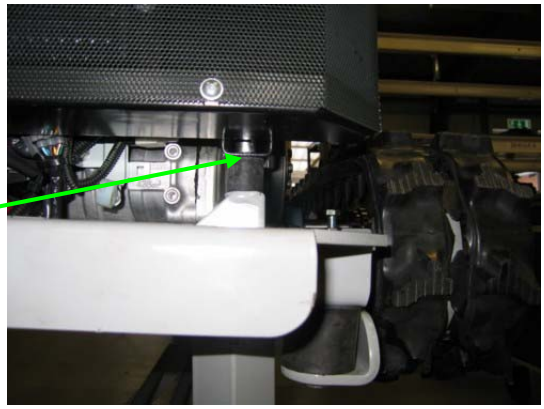


1. Remove the nut on the upper side of the triangle.
2. Turn the belt downwards, then the rubber shock absorber can be replaced.

6 AIR TRAP RUBBER BUMPS

When servicing carefully check the rubber shock absorbers for cracks and other damage.





The simplest way to remove the two rear rubber shock absorbers is by using the long extension of the socket wrench [1].

7 Hydraulics

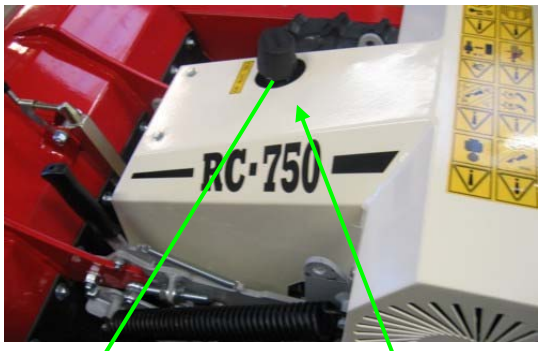
The hydraulic system consists of two variable hydraulic pumps each driving its hydraulic motor. To avoid dirtying the oil, the dipstick has a 3 mm air filter. The dipstick has an embedded 0.2 bar counter-valve which:

- Keeps the oil in the tank when driving on slopes.
- Prevents condensation in the tank.

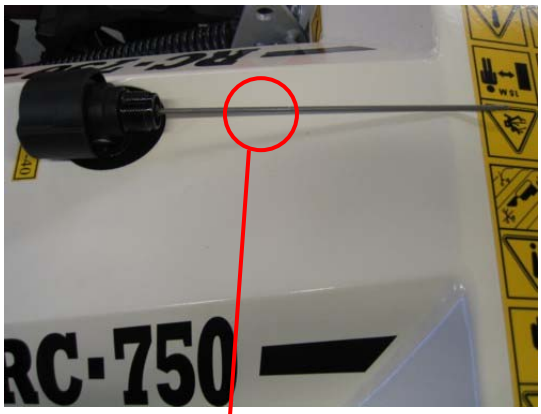
See the hydraulic diagram in section 7.7.

7.1 Checking the hydraulic oil level

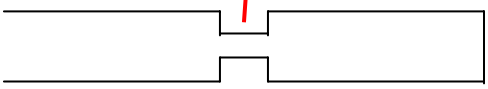
The hydraulic oil must always reach the cut-out in the dipstick. If the oil level is too low, refill. The oil must not contain water or impurities. Before unscrewing the dipstick, first always clean the surrounding area.



Dipstick Oil level

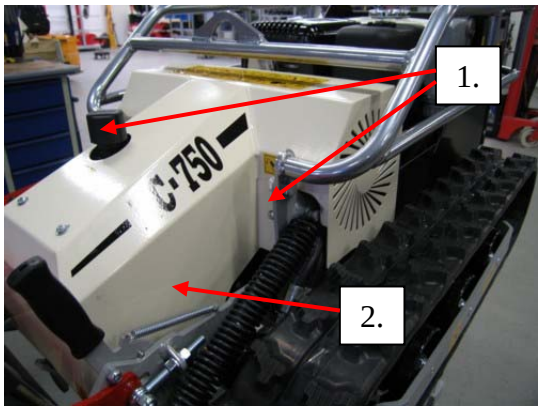


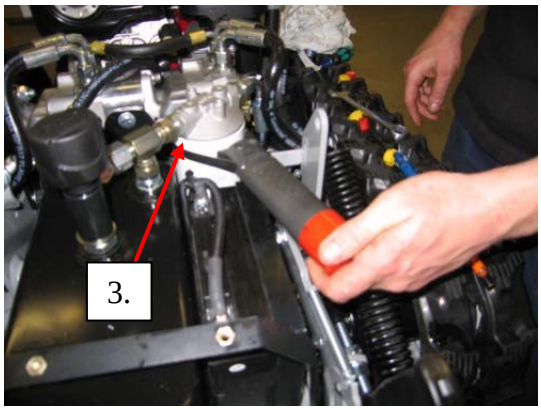
When refilling pour the oil slowly and carefully. Remove spilt oil immediately.
In the factory the hydraulic tank is filled with Texaco Havoline Extra SAE 10W-40 classification API SJ semi-synthetic slightly flowing oil. Only use this oil. Before using another brand, contact Texaco for information on compatibility.

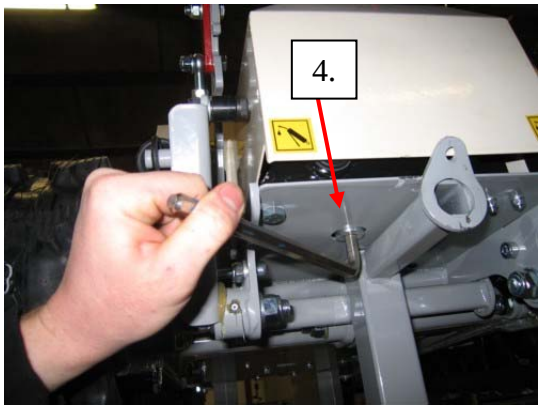


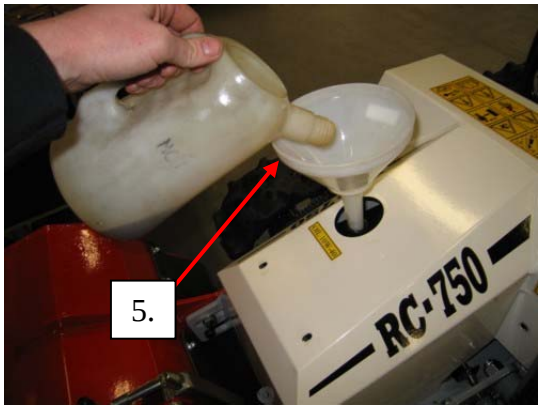
7.2 Replacing the gear oil and filter

The gear oil and filter are replaced as follows:









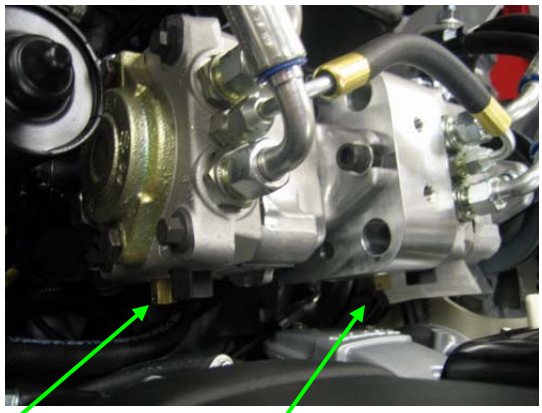
1. Remove the branches protective guard, loosen the two screws indicated by the arrow and tilt the equipment backwards.
2. Remove the hydraulics guard.
3. Replace the oil filter. Before mounting a new filter, do not forget to lubricate the gasket with oil.
4. Drain the oil off by loosening the oil drain plug. After draining tighten the plug again.
5. Fill with approx. 6 litres of 10W40 oil.

Start the machine and let it run for about two minutes, then top up the oil.

7.3 Machine towing

If the machine hydraulics fail or if the motor won't start, the machine can be towed. First, remove the hydraulics guard, then turn each of the towing screws twice with a wrench.
Now the machine can be towed.

After towing, tighten the towing screws to 14 Nm.



Towing screw - right pump

Towing screw - left pump

Note: There are two screws on the right side of each pump. The lower, "gold-coloured" screw is used for towing.

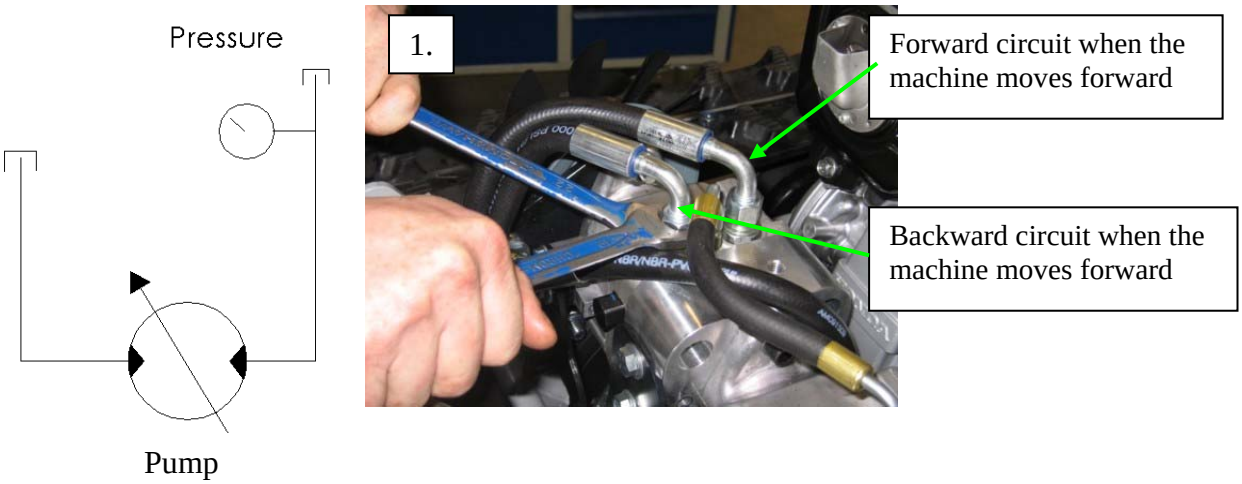
Warning: Towing screws must only be loosened when the machine is on a flat surface. If the screws are loosened when the machine is on a slope the machine might start moving.

Warning: Do not loosen the towing screws until the engine is completely cold because the engine exhaust pipe, which is near the screws, may burn you.

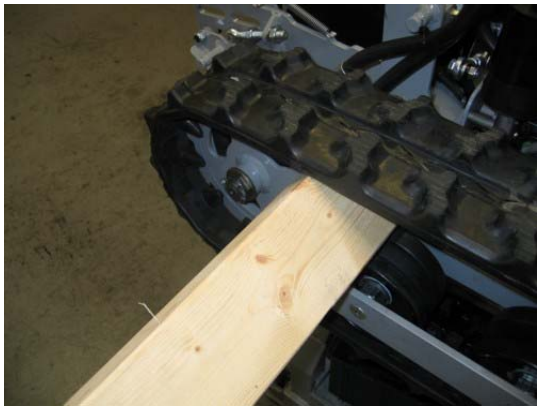
7.4 Checking hydraulic pressure

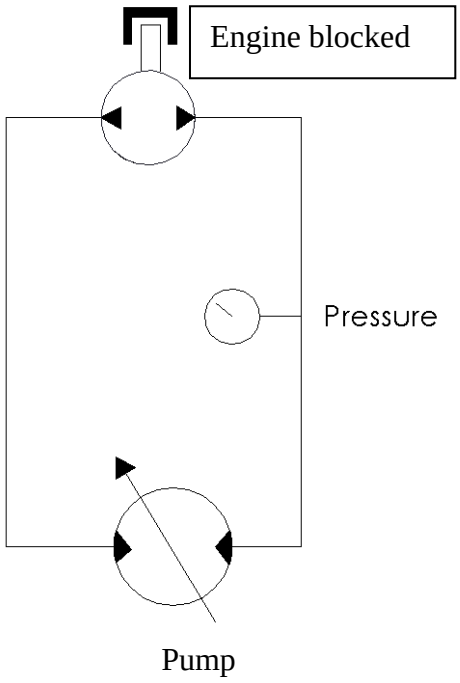
The pumps have a safety relief valve which takes the oil to oil-consuming machine components when the pressure exceeds 160 bar.
Important: Before checking the pressure, make sure the towing screws are tightened.

When testing the hydraulic pressure, start by measuring the pressure of the hydraulic pump. Remove the hydraulic hoses between the engine and the measured pump. Block the reverse hose and insert the T-shaped connection and the testing lubricator to the forward circuit when the pressure is measured. See the picture below.
The pressure is measured with the Honda engine idling and with the forward travel speed set to 50 %. If the pump is all right, the pressure will measure between 160 and 180 bar.



The direction indicated in the picture for forward and backward circuits applies to both pumps.
After checking the pressures of the pump, measure the engine pressure. First, insert the T-shaped connection and the testing lubricator to the forward circuit. Block the engine by inserting the iron rod or a piece of wood in the gap between the drive wheel and the belt.

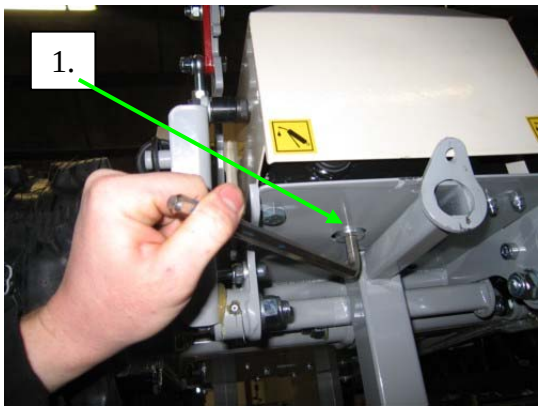


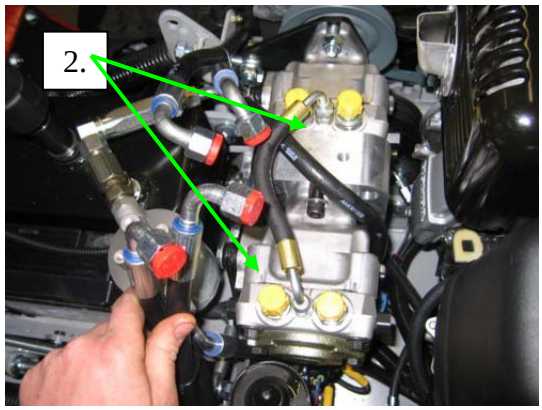


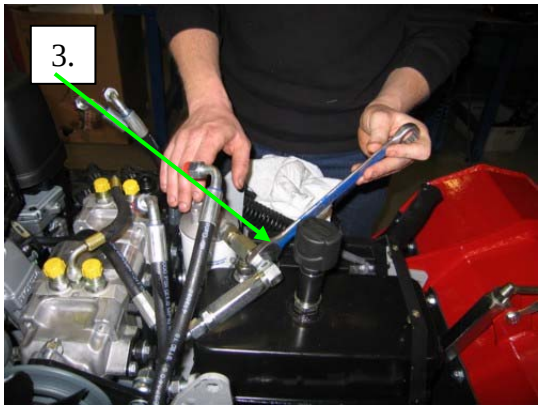
Measure the pressure with the Honda engine idling and with a forward travel speed set to 50 %. If the engine is all right, the pressure will measure 160 bar.
When testing the oil must be between 40 and 50^{o} C.

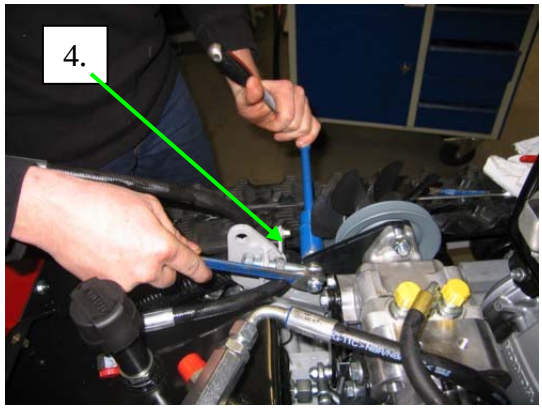
7.5 Replacing the Pump

First, remove the branches protective guard, the pump guard and the guard on the right side of the engine, see sections 1.1, 1.2 and 1.3. Remove the hydraulic pump belt, see section 2.5.

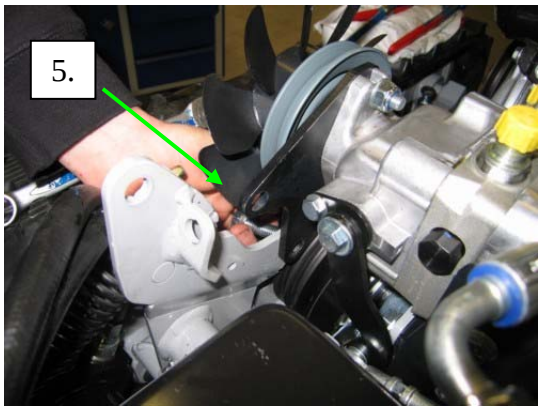


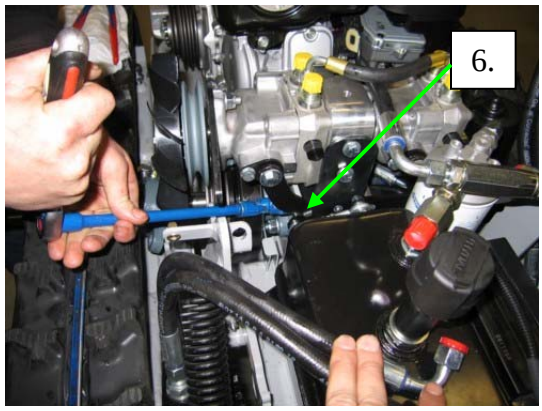


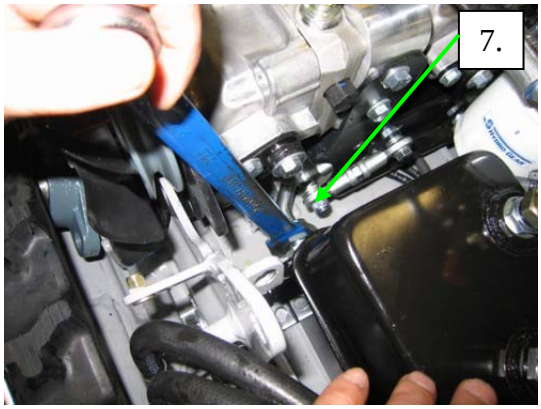


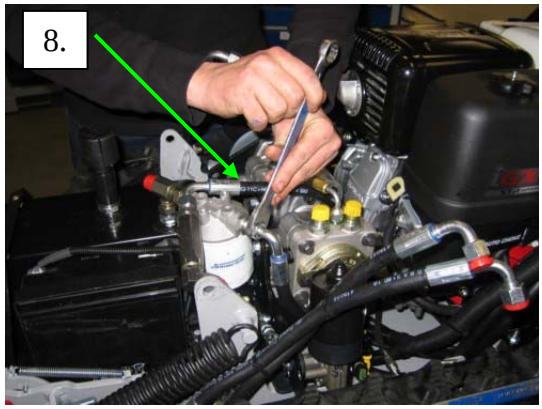


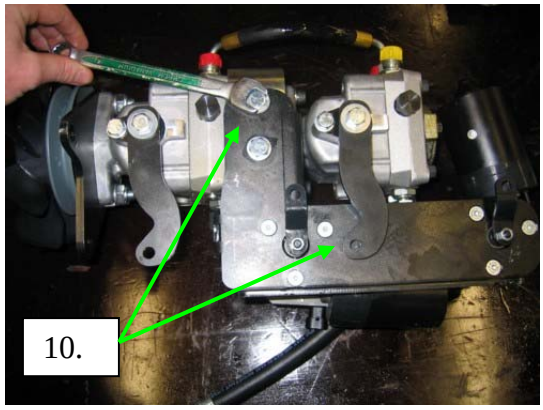
1. Drain the oil by loosening the oil drain plug.
2. Remove the pressure hoses on the left and right engine.
3. Remove the counter-valve at the T-shaped connection on the tank.
4. Remove the belt tension adjusting screw on the pump.











5. Remove the hanger screw.
6. Remove the hanger screw.
7. Loosen and remove the suction hose.
8. Remove the reverse hose on the filter.
9. Lift up the pump from the machine.
10. Remove the ball joint of the arm, servo-engine support and the ventilator and driving pulley.

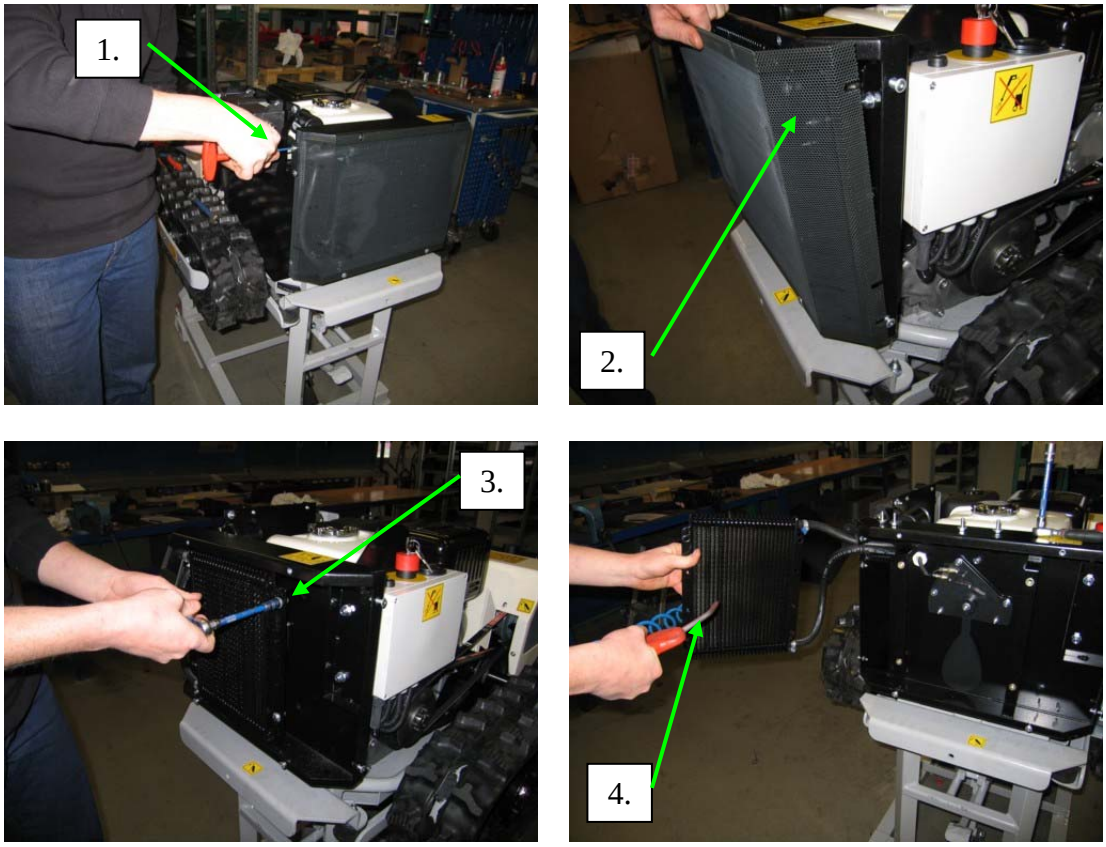
When replacing the pump do not remove the arms of the servo-engine otherwise the zero position of the servo-engine must be recalibrated. See section 8.3 on setting the zero position of the servo-engine.

Assemble in the reverse order from above.

Important: treat all screws screwed into the pump and the pump shaft with Loctite (thread securing).

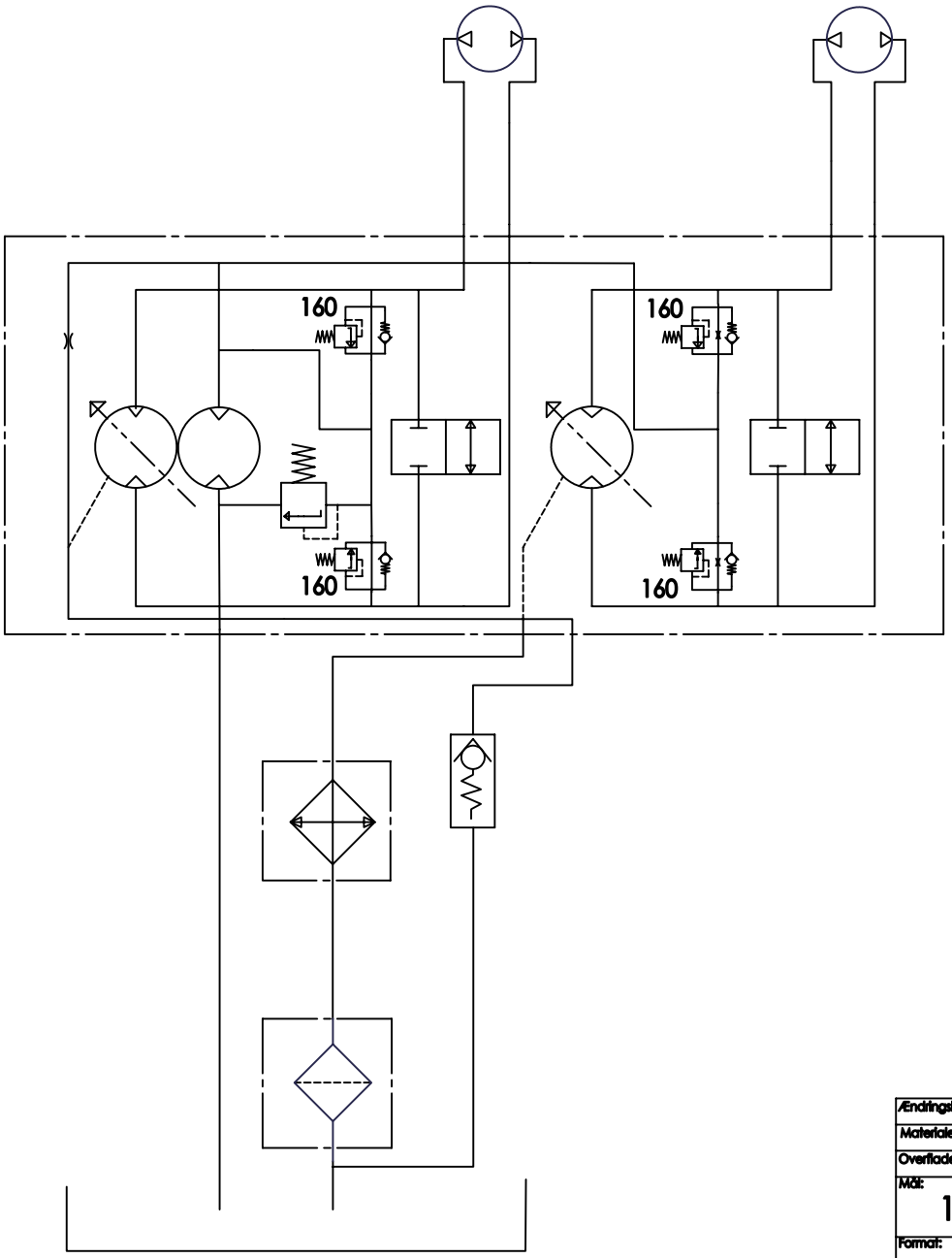
7.6 Cleaning the oil-cooler

The cooler is cleaned as follows:
First, remove the branches protective guard, see section 1.1.



1. Loosen the eight screws of the mesh and remove the two screws completely on the top in the middle.
2. Tilt the mesh backward and remove it by lifting it sideways up.
3. Loosen the four screws holding the cooler.
4. Clean the cooler with compressed air from the rear part of the cooler.

Mount the cooler in the reverse order than stated above.

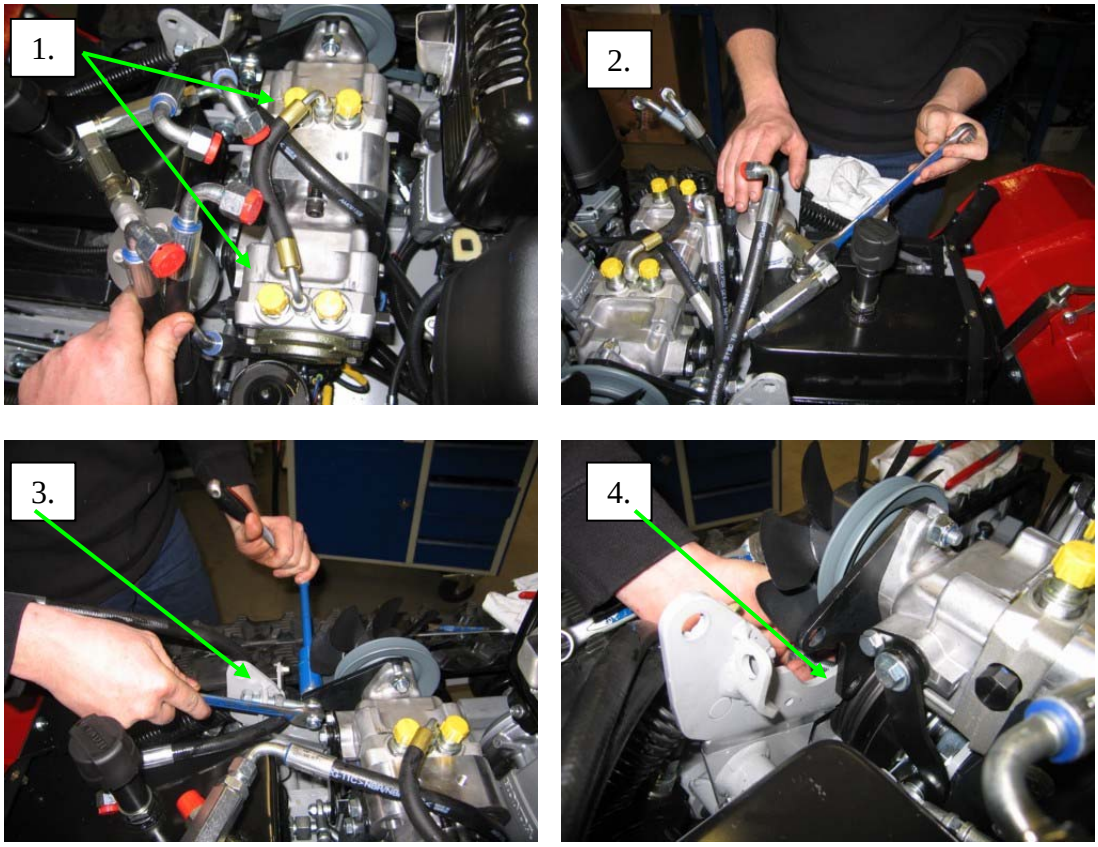


Ændringsbesk: –				
Materiale:			Generel tol.:	DS/ISO 2768 m/K
Overfladebeh.:			Svejsekval.:	DS 316 Sømkl. A
Mål: 1:1	EJENDOMSRET OG FORTROLIGHED INFORMATION INDEHOLDT PÅ DENNE TEGNING TILHØRER ALENE TIMAN A/S. REPRODUKTION I DELE ELLER SOM KOPI UDEN SKRIFTLIG TILLADELSE FRA TIMAN A/S FORBYDES.	TIMAN Fabriksvej 13, DK-6980 Tim Tel: +45 97 330 360 Fax: +45 97 330 350 E-mail: timan@timan.dk	Tegn. dato: 030310	Sign.: VN / Rev. dato: – / Sign.:	Kirl.: – / Kirl.: –
Format: A3 / Side: 1/1				
Skaler ikke tegningen	Vægt: gram		Udskrevet d.	04-03-2010
Emne: Hydraulikdiagram RC-750			Tegn. nr.:	-

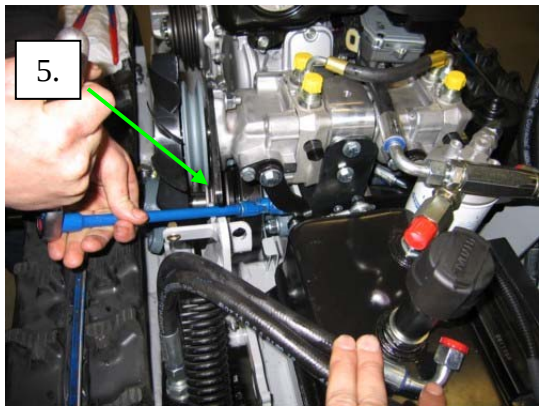
8 Servo-engine

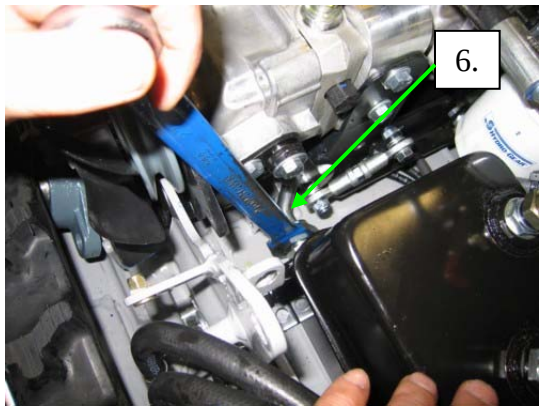
8.1 Replacing the Servo-engine

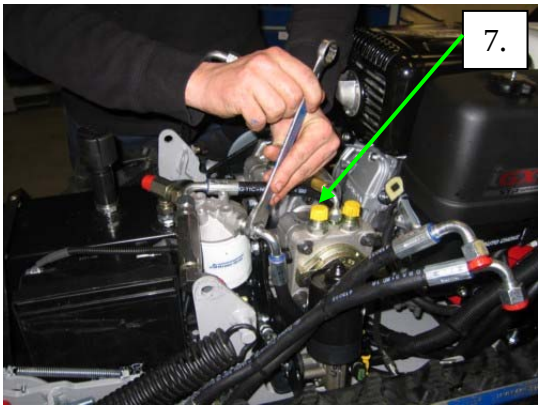
First, remove the branches protective guard, the hydraulics guard and the guard on the right side of the engine. See sections 1.1, 1.2 and 1.3. Remove the hydrostatic pump belt, see section 2.5.

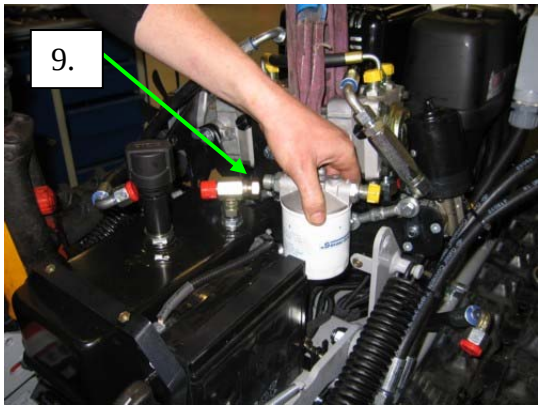


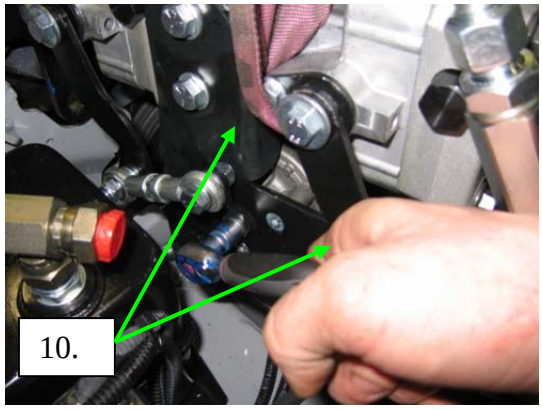
1. Remove the pressure hoses to the left and right engine.
2. Remove the counter-valve at the T-shaped connection on the hydraulic tank.
3. Remove the belt tension adjusting screw on the pump.
4. Remove the hanger screw.



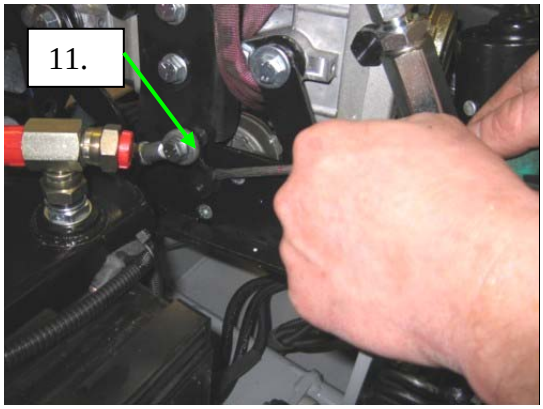


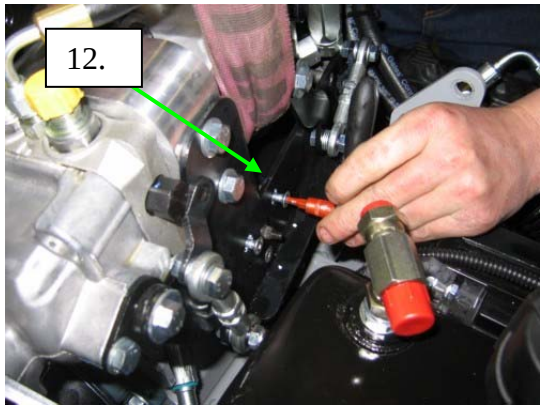


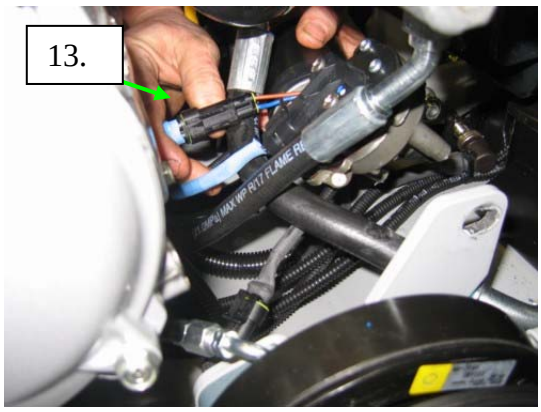


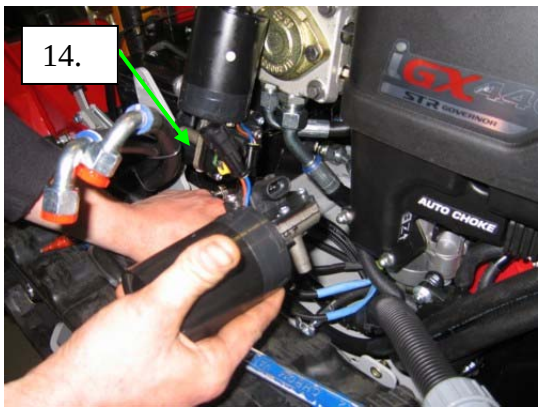


5. Remove the hanger screw.
6. Loosen the rotating device on the suction hose, approx. one turn.
7. Remove the reverse hose on the filter.
8. Lift the pump up 20 cm by fastening the lifting lugs around the pump. When lifting, check if the suction hose rotates.
9. Remove the reverse filter.
10. Loosen the servo-engine arm.









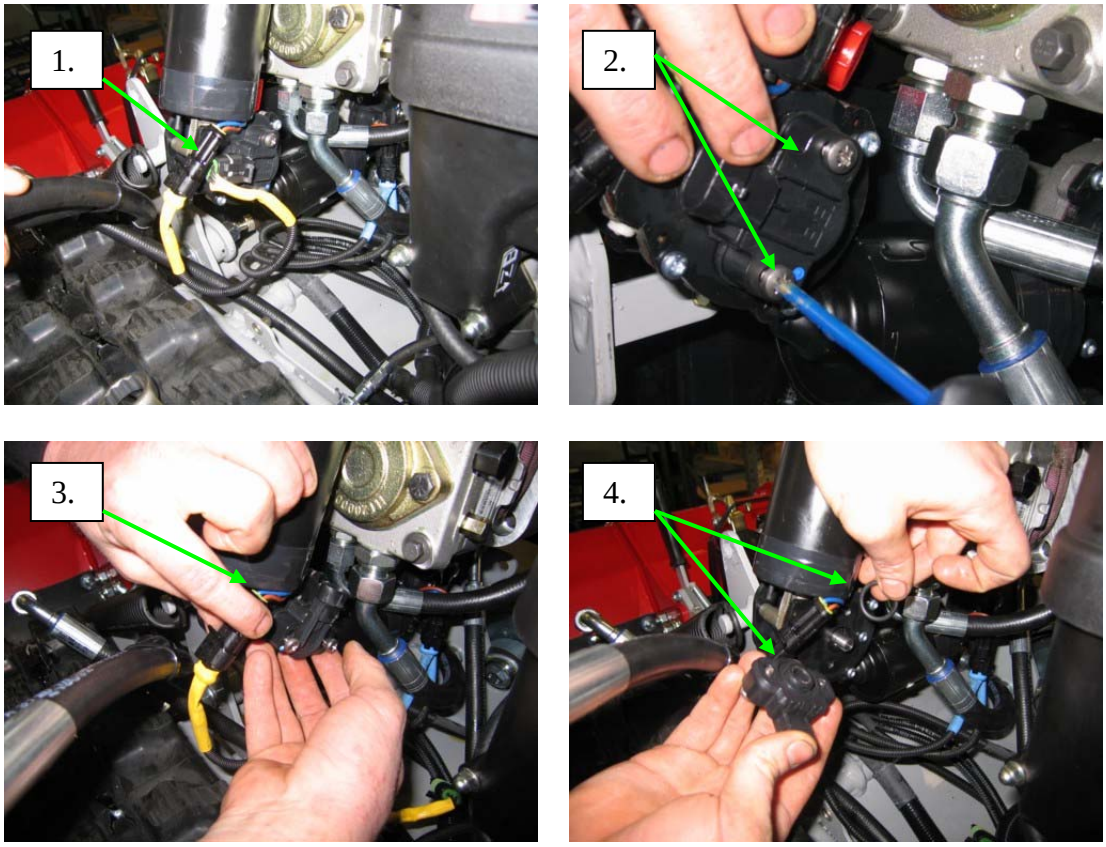
11. Remove the arm of the servo-engine with a screwdriver.
12. Loosen the three screws holding the servo-engine.
13. Remove the electrical connection of the servo-engine.
14. Remove the servo-engine.

Assemble in the reverse order from above.
Please note:

1. Assemble the servo-engine arm according to section 8.3.
2. The screws holding the servo-engine, see picture 12, must be treated with Loctite (thread securing).

8.2 Replacing the Potentiometer

First, remove the branches protective guard, the hydraulic pump guard and the engine compartment guard. See sections 1.1, 1.2 and 1.5.



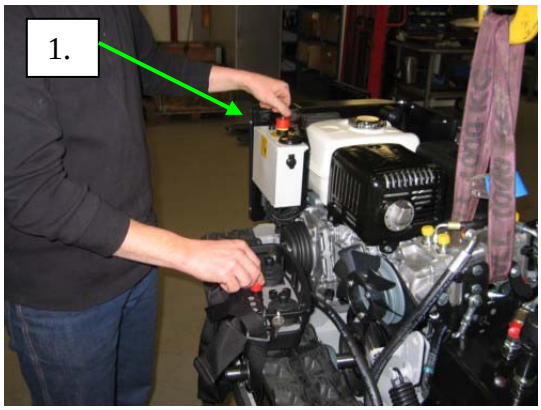
1. Remove the electrical connection of the potentiometer.
2. Loosen the two screws holding the potentiometer.
3. Turn the potentiometer 90° clockwise.
4. Remove the potentiometer. Do not forget the O-ring.

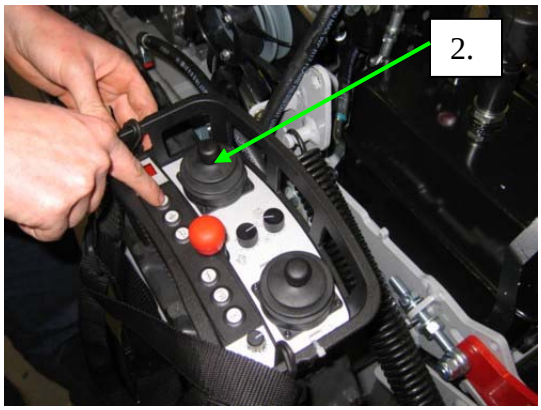
Assemble in the reverse order from above.
Please note:

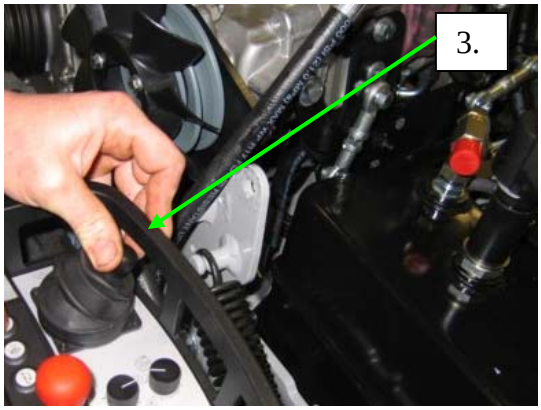
1. Grease the O-ring before mounting it on the potentiometer so that it stays in place when assembling the potentiometer.
2. When assembling the potentiometer, see picture 2, make sure that the screws are located in the middle of the lengthwise holes in the potentiometer.

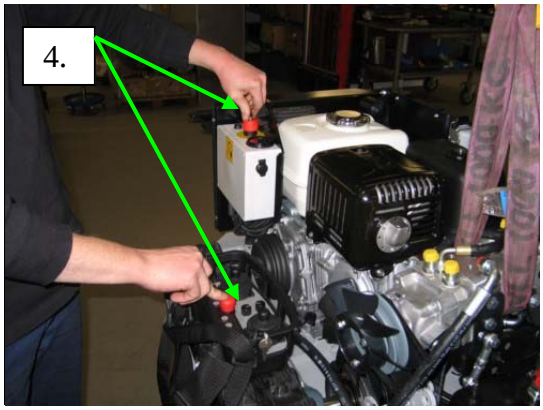
8.3 Setting the zero position of the servo-engine

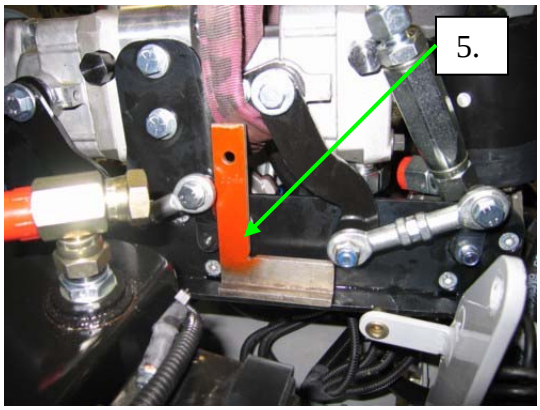
When the arms of the servo-engine are being remounted make sure that they are aligned correctly otherwise the machine will not go straight.
Set as follows:











1. Before mounting the arms on the servo-engine, supply electricity to the machine by pressing the emergency button on the remote control and on the machine.
2. Press the horn.
3. Put the left joystick in the maximum position to start the servo-engine shaft rotating. When the handle is released the servo-engine will automatically find the zero position.
4. Press the emergency button on the machine and on the remote control.
5. Push the servo-engine arm above the shaft. Make sure that the arm is perpendicular in the bend of the servo-engine support. Use an angle iron. Tighten the engine nut.

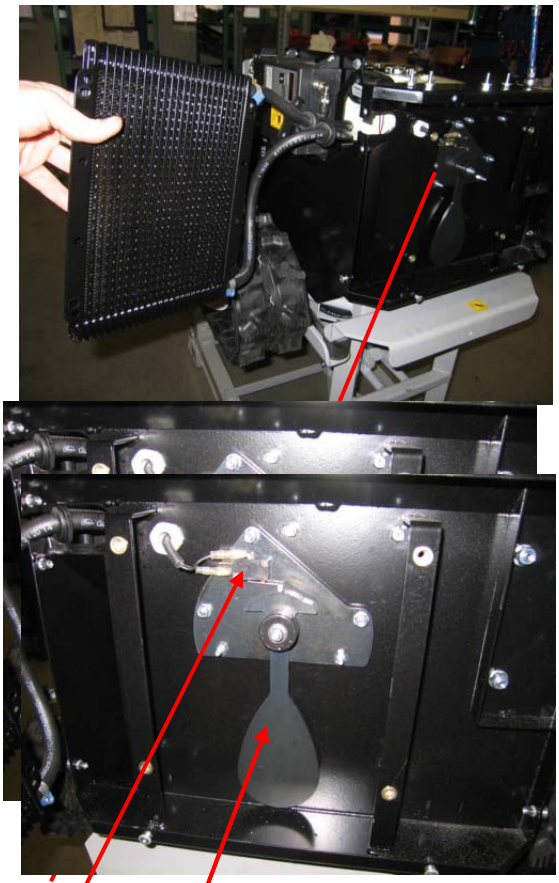
When tightening the nut make sure that the shaft and the arm do not rotate around each other.
Always check after assembling the arm. Then supply electricity to the machine and tilt it to the maximum using the remote control.

9 TILT SENSOR

This sensor does two things.

1. Engine protection. The engine is approved and tested to drive on slopes with a maximum angle of 58 degrees. When driving on more than 58 degree slopes the engine loses its lubricating capability which can result in an accident..
2. Protection against the machine turning over.

The sensor works so that the pendulum activates the contact.
When the contact is on for more than 1 second the machine starts beeping and the mowing mechanism stops.

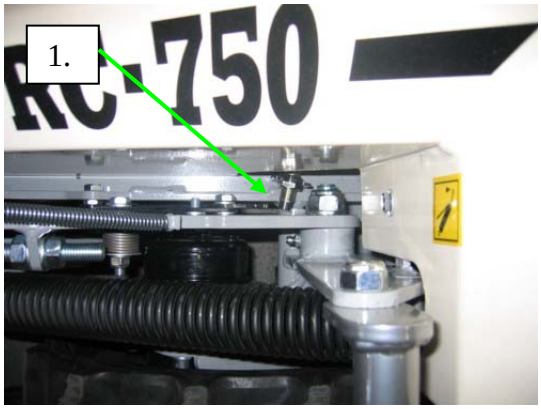


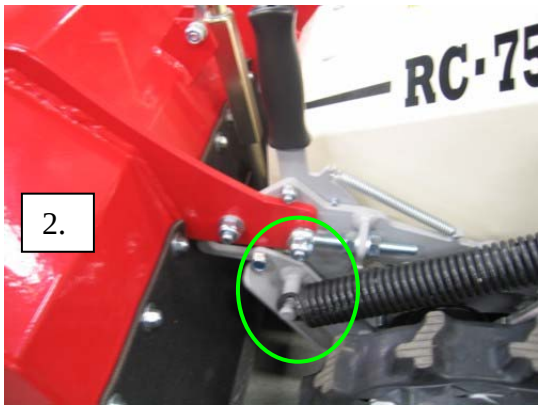
Warning:
If the machine drives into a hole or if it skids on a slope, the sensor cannot react before the machine turns over.

When checking the tilt sensor, swing the pendulum to its maximum with the engine running. The machine should start beeping.

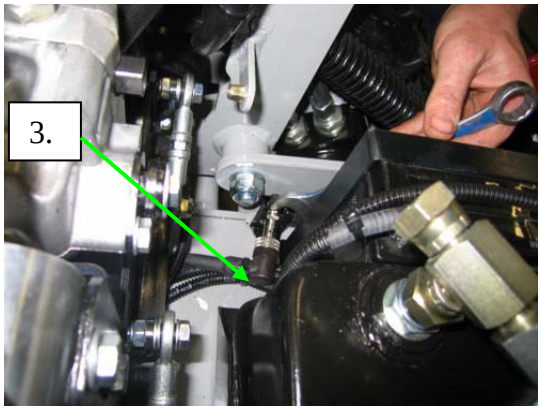
10 MOWING MECHANISM SAFETY SENSOR

To avoid starting/setting the machine in motion with the mowing mechanism in the service position, the machine has an NPN safety sensor which is activated when the arms of the mowing mechanism are lifted.





The sensors are located according to the picture [1].

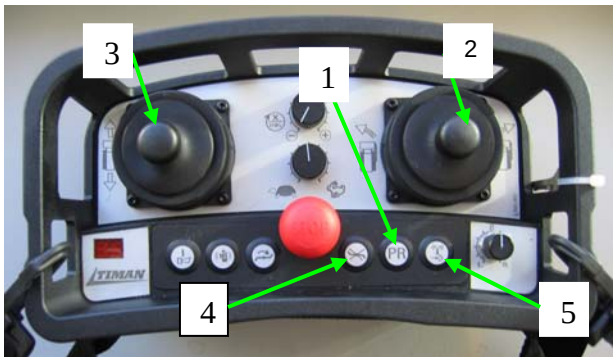


Once the handle is activated and the mowing mechanism is lifted from the supporting arms influenced by the springs [2], the NPN sensor must be deactivated which stops the engine. When the sensor is not active, the NPN diode is not lit.
The sensor is set by loosening the nut, see picture [3]. Make sure that the sensor is set so that the mowing mechanism does not deactivate the sensor when it is in a working position. The sensor has a working range of 5 mm.

11 REMOTE CONTROL

11.1 Zero position programming

The machine is set by the manufacturer in the factory so when the joysticks are released, the machine idles. This can change over time and the zero position can be found again by programming the remote control.
Before using this function, lift up both belts approx. 5 cm above ground with a fork lift truck or a jack using the lifting lug.
Start the machine and set the revolutions to 20 %.



The find the zero position as follows:

1. Activate the PR button [1] for 3 seconds, the display will show PR.

2. To set the left belt move the joystick [2] to the left and release it.

3. Then activate the joystick [3] in several phases. If the belt reverses, move the joystick from the zero position completely forward and then release it. If the belt moves forward, move the joystick backwards. Repeat this until the left belt is idling. Now press the button [4] to save the setting.

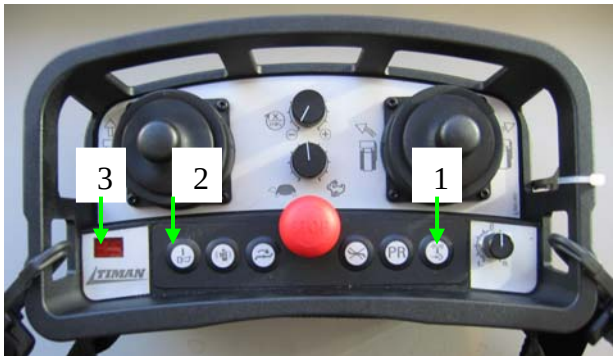
4. To set the right belt move the joystick [2] to the right and release it.

5. Then activate the joystick [3] in several phases. If the belt reverses, move the joystick from the zero position completely forward and then release it. If the belt moves forward, move the joystick backwards. Repeat this until the right belt is idling. Now press the button [5] to save the setting.

6. Activate the emergency button on the remote control.

11.2 Frequency change

If the remote control signal is interrupted, the machine stops automatically. To continue operating, change the channel on the remote control.
Do this by holding the button [1] down and activating the button [2] at the same time.
This will change the channel number.
When the channel is changed, the horn beeps briefly to indicate the change.
The number of the channel in shown on the display [3].



NBB Control box		Description
Input		
	Ground (GND)	Gets a signal when the emergency stop of the Timan control box is activated
	12 V battery +	12 V fixed voltage
	Safety circuit ok / motor enable	Feedback to steering that safety circuit is ok Coupling is deactivated if safety cicuit is broken Servomotors go into neutral position if safety circuit is broken
	Run signal / stop	Gets a signal when NPN sensor is ok, safety circuit there stops the motor, if K2 is broken Circuit is broken if emergency stop is activated
	Tilt switch input	Circuit that breaks mechanically if machine is running at an inclination abover 58 deg. If no signal - the clutch falls out and the machine starts beeping. Delay of approx. 1 sec.
	Charging light	Charge light signal from motor 0V, if motor is running. 12 V if motor is turned on. Clutch is deactivated if there is 12V to the lamp Motor cannot start if there is 0V on charge light, to prevent activation of self-starter when motor is running.
	Left potentiometer signal 0-5V	Feedback to steering about location of servomotors
	Right potentiometer signal 0-5V	Feedback to steering about location of servomotors
Output		
	Left potentiometer GND	Ground for left potentiometer
	Left potentiometer 5V	5 V supply for left potentiometer
	Left servomotor A	Left servomotor lateral movement gets signal when left or right joystick is activated
	Left servomotor B	Left servomotor lateral movement gets signal when left or right joystick is activated
	Right potentiometer GND	Ground for right potentiometer
	Right potentiometer 5V	5 V supply for right potentiometer
	Right servomotor A	Right servomotor lateral movement gets signal when left or right joystick is activated
	Right servomotor B	Right servomotor lateral movement gets signal when left or right joystick is activated
	Clutch	Clutch for cutter. Is deactivated on emergency stop at Timan control box. Remains engaged on emergency stop at remote control, to reduce the stopping time Can only be set if there is 0V to lamp
	Clutch GND	Ground for clutch
	Tilt switch 5V	Circuit that breaks mechanically if machine is running at an inclination above 58 deg.
	Horn 12 V	Beeps automatically on activation of tilt sensor, and if emergency stop of machine is not activated before it is left alone Can be activated manually with remote control
	Horn GND	Ground for horn
	Engine Start	Start of Honda motor - can only start if safety circuit is ok
	Throttle control 0-5V	Revolutions of Honda motor are changed When activating clutch, revolutions are automatically changed to 1900 rpm. After engagement the previously set value is found.

The machine stops automatically if:

a disturbing frequency occurs;

the machine gets out of reach of the remote control.

* Shottky Diode SB 140
3.190.1042

	12V-Input	12V-Input	12V-Input	Drive Right B	GND	Drive Right A	5V tilt switch *	5V-poti right *	Poti drive right	BSL	TXD	GND - Poti	Tilt switch IN	Lamp IN	Clutch ON	RUN	HORN	Engine START		
			A	B	A	B	B	C	C	X1.1	X1.2	C	B	C		C	B			
			1	1	2/M	2	3	1	2	rd	rd	3	4	4	P	5	5	N		
			23	3	24	4	13	7	8			9	14	19		20	15			
	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11	Y12	Y13	Y14	Y15	Y16	Y17	Y18	Y19	Y20

Cable no.:
Wire no.:
Pin no.:
Terminal strip no.

	Z1	Z2	Z3	Z4	Z5	Z6	Z7	Z8	Z9	Z10	Z11	Z12	Z13	Z14	Z15	Z16	Z17	Z18	Z19	Z20
							C					B	B		B		C		C	
					blue	blue	6		blue	rd	rd	6	7		8		7		8	
					16	2	10		12	X1.3	X1.5	5	6		18		11		21	
					GND	GND	* 5V-poti left		GND - Poti	GND	RXD	Drive Left B	Drive Left A		Throttle 0-5V		Poti drive left		Engine-enable	

Terminal strip no.:
Cable no.:
Wire no.:
Pin no.:

E-AD08A0 V1/2
X1.6 X1.5 X1.4 X1.1 X1.2 X1.3
X4.1 X4.2 X4.3 X4.4 X4.5 X4.6 X4.7 X4.8 X4.9
KFZ-Relais 3.680.1005 K1
X1.19 X1.20 X1.21 X2 X2.13 X2.14

12V
GND
K1
K1
12V
GND
K2
K2

X4.9		N		Engine Start
X4.3	17	9	B	Output Engine Start
X4.2	23	red		Common Engine Start
X4.8		M		GND
X2.14		P		Clutch ON
X1.21	1	10	B	Output Clutch ON
X1.19	23	red		Common Clutch ON

Pin no.:
Wire no.:
Cable no.:

12V-Relais
3.680.1002

HF

X1.5
X1.3 X1.2 X1.1
Case-cover-inside

NOTE			Plug-and-socket connection and cable:	Part-no.:	Quantity
HF - Part:	FM A/P 2sec		System-plug	3.300.2002 (Casing with cover)	1
			Insert	3.210.2004 (24 pol. male)	1
			Cable loop 1	3.400.7040 (34 x 0,75mm²)	1
OVERCURRENT PROTECTION	YES	NO	Cable loop 2	A - KAB1920 (2 x 1,5mm²)	1
	X		Cable loop 3	B - 3.400.7018 (12 x 1mm²)	1
			Cable loop 4	C - 3.400.7020 (9 x 0.75mm²)	1
RECEIVER POTTED	YES	NO	Cable loop 5		
	X		Cable loop 6		
			Cable loop - Inside	red (1mm²); blue(0,75mm²); rd,P,N(0,5mm²)	

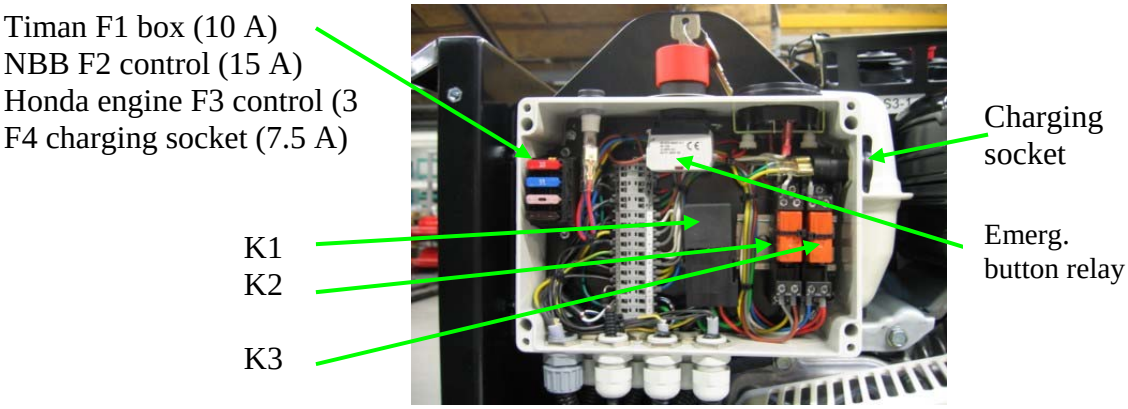
Serial no.:	Ref. 999 904 5593	
Model:	Mower	
Customer:	TIMAN A/S	
Date:	2009.07.15	
Name:	P. Heit	
Modification:		
Program:	e2955 v21.H86	

RECEIVER WIRING DIAGRAM

Colour:	Face Blade:		
	Upper part:	black	2.250.1500
	Lower part:	black	3.300.1502

12 DESCRIPTION OF THE ELECTRICAL BOX

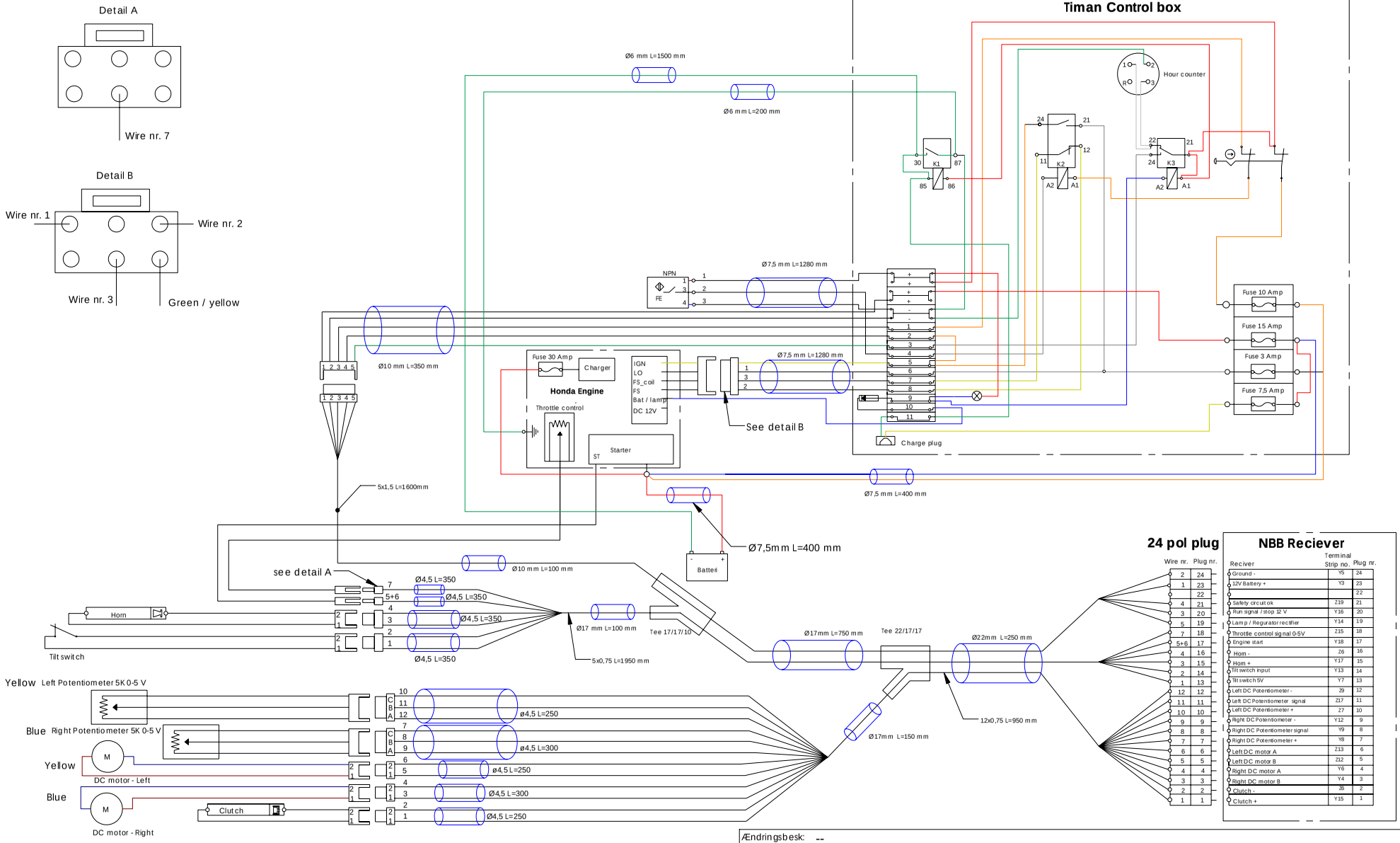
The box on the right side of the machine is a Timan control box. The box includes an emergency stop, hour counter, circuit breakers and relays, ignition indicator light and the supply of the NBB control box.
See the electrical diagram in section 12.1.
IMPORTANT Never replace the fuses with fuses of a higher ampere value. Before fitting a new fuse, first always find out the cause and remove the problem. The upper fuse is F1 and the lower fuse is F4.



Relays:

K1: Negative battery terminal relay 12V 70A
K2: Fuel ignition (IGN) / ignition coils relay
K3: Hour counter and ignition indicator light relay
Emergency stop double relay which stops the power supply to K1, K2, K3

The electrical box also has a charging socket for charging the battery of the machine without removing the hydraulics guard.



Ændringsbesk: --			
Materiale:		Generel toll.:	DS/ISO 2768 m/K
Overfladebeh.:		Svejsekval.:	DS 316 Sømkl. A
Mål: 1:1	EJENDOMSRET OG FORTROLIGHED INFORMATION INDEHOLDT PÅ DENNE TEGNING TILHØRER ALENE TIMAN A/S. REPRODUKTION I DELE ELLER SOM KOPI UDEN SKRIFTLIG TILLADELSE FRA TIMAN A/S FORBYDES.	Tegn. dato: 150110	Sign.: VN / Ktrl.: --
Format: A3 / Side: 1/1		Rev. dato: --	Sign.: -- / Ktrl.: --
Skaler ikke tegningen	Vægt: gram	Udskrevet d.	19-10-2010
Emne: El Diagram		Tegn. nr.:	-04

TIMAN
Fabriksvej 13, DK-6980 Tim
Tel: +45 97 330 360
Fax: +45 97 330 350
E-mail: timan@timan.dk

13 Troubleshooting

Problem	Possible cause	Possible solution
Starter works but the engine won't start	Spark plug [*1]	Check the gap or replace the plug
	Damaged wiring	Replace or repair wiring
	Fuel filter is blocked [*1]	Clean the filter in the carburettor
	No fuel	Refill
	Vacuum valve under the fuel tank	Replace the valve
	Flash of the engine control unit [*1]	See section 14.4
	Mowing mechanism is in the service position	Set the mowing mechanism to the working position
	Defective NPN sensor	Replace the sensor
	Too great a working range of NPN sensor	Keep adjusting the sensor until the diode lights
	Defective K2 relay	Replace the relay
Engine starter does not work	Discharged battery	Recharge the battery
	The engine control unit indicator light does not light up [*1]	Check 3 A fuse
	Defective 30 A fuse	Replace the fuse 30 A at the back of the engine
	Gas potentiometer is not in zero position	Turn the potentiometer to the zero position
	Horn is not activated	Activate the horn
	Defective 10 A, 15 A, 3 A fuses	Replace the fuses
Engine smokes	Air filter	Clean/replace the air filter
Mowing mechanism does not turn on	Defective K3 relay	Replace the relay
	Defective clutch	Replace the clutch
	Check wiring and plug	Replace wiring or plug
	Defective mowing mechanism driving belt	Replace the belt
	Defective clutch driving belt	Replace the belt
Mowing mechanism stops	Tilt sensor is active	Drive to a flatter surface
Machine does not go	Defective servo-engine	Replace the servo-engine
	Towing screws unscrewed	Tighten the towing screws
	Damaged driving belt	Replace the belt
Vibration in the mowing mechanism	Defective bearings	Replace the bearings in the mowing mechanism
	Dirt on the flail axis	Clean the flail axis
	Flail cutter is missing	Mount a new flail cutter
	Axis is curved	Replace the axis
	Worn out flail cutter	Mount new flail cutters
Machine does not have sufficient thrust	Damaged hydraulic pump	Replace the pump
	Loose driving belt	Tighten the belt
	Defective hydraulic motor	Replace the hydraulic motor
	Overheated oil	Clean the cooler, the rear mesh and the mesh on the guard above the hydraulic pump
	Towing screws unscrewed	Tighten the towing screws
	No gear oil	Refill oil
No contact between the remote control and the receiver	Machine out of reach	Take the remote control closer to the receiver
	Radio signal interrupted	Change frequency
	Emergency button on the machine is activated	Deactivate the emergency button
	Defective 15A fuse	Replace the fuse
	Emergency button on the remote control is activated	Deactivate the emergency button

Machine makes a noise	Defective flange bearing at the clutch	Replace the bearing
	Defective guard bearing	Replace the bearing
	Defective mowing mechanism bearings	Replace the bearings
Bad mowing	Worn out flail cutters	Replace all flail cutters
	Forward travel is too fast	Reduce speed
	Wrong type of the flail cutter	Replace the type of flail cutter
Horn does not work	Mowing mechanism is in the service position	Set the mowing mechanism to the working position
	Defective 10 A, 15 A fuses	Replace the fuses
Horn is activated automatically	Tilt sensor is active	Drive to a flatter surface
	Emergency button on the remote control is activated Emergency button on the machine is not activated	Activate the emergency button on the machine

[*1] See section 14.4

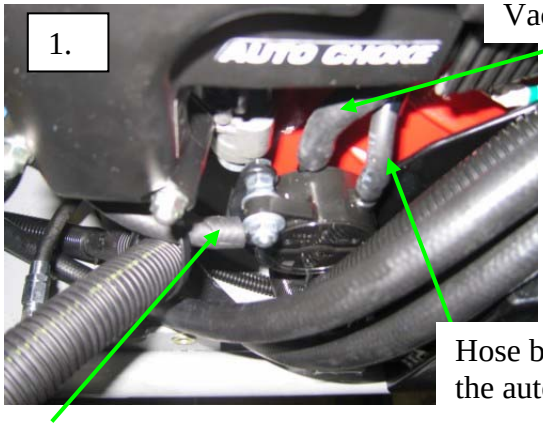
14 HONDA iGX 440

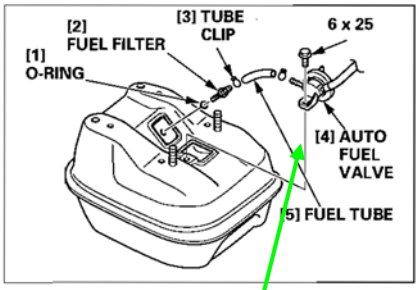
To find and remove defects and to service the engine refer to the service manual of the Honda engine in section 13.4.
Normally, the Honda engine works on a gradient of up to 20 degrees so before it is supplied to Timan, it is modified. The engine can therefore work on a gradient up to 58 degrees. The changes are described below.

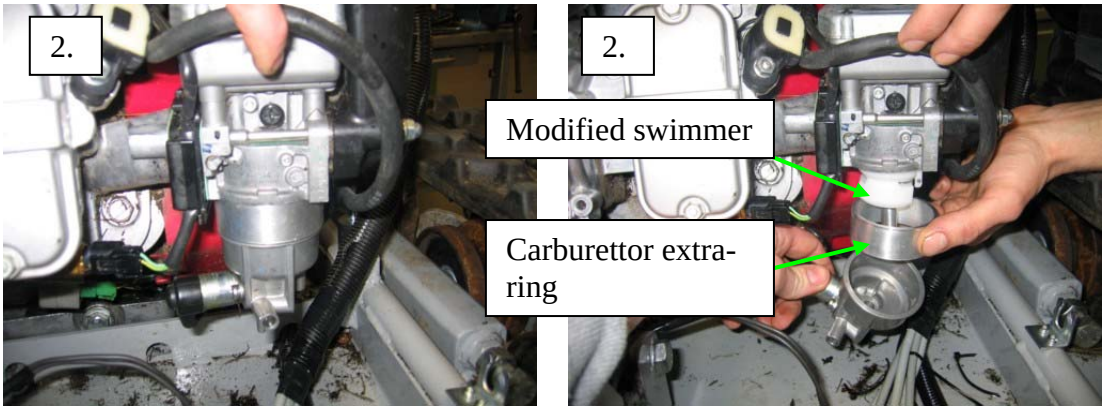
14.1 Modification of Honda iGX440 engine

The engine is changed as follows:

1. Different gasoline pump
2. Different modified gasoline swimmer and distance ring to extend the carburettor.
3. Modified crank shaft so that the lubrication capabilities of the engine are significantly improved.
4. Shortened crank shaft.
5. Different suction hose to the gasoline tank to avoid the suction branch of the tank leaking gasoline when driving on slopes.
6. Oil level alarm removed.







14.2 Diagnostic connection

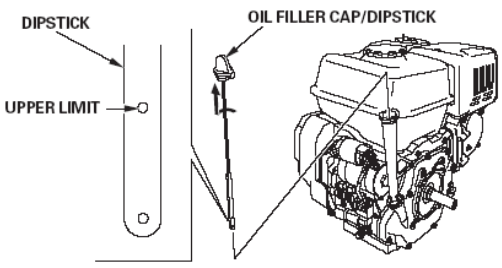
The Honda engine has a diagnostic connection to connect to a computer. With the computer connected the following engine data can be read:

- Throttle valve opening
- Engine revolutions
- Number of engine hours
- Sensor fault
- Previous error codes of the engine

The diagnostic connection can only be used by authorized Honda dealers. See the connection location below:

14.3 Replacing the motor oil

Loosen the oil drain plug, drain the oil, tighten the plug and fill with approximately one litre of 10W40 motor oil.

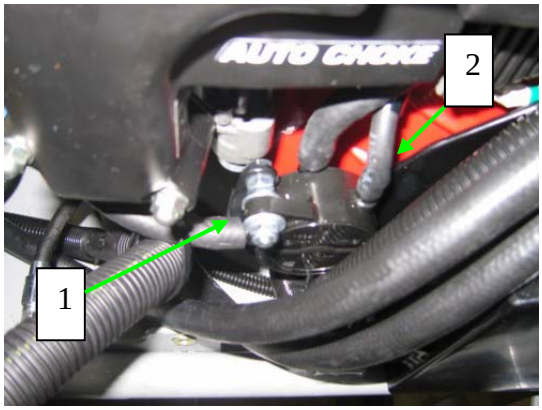


Important: Check the oil level every four hours during operation. The engine does not have an alarm sensor to indicate when the oil level is too low.

In the factory the engine is filled with Texaco Havoline Extra SAE 10W-40 classification API SJ semi-synthetic slightly flowing oil.
If another product is used first find out whether it can be mixed with this brand. If oil which is not mixable with this brand is used, the old oil must be completely drained before filling with new oil.

14.4 Fuel system troubleshooting

If the engine runs out of petrol problems can occur with getting fuel to the carburettor.
Check this by removing hose no. 1 and then pressing the button on the remote control. If petrol is supplied by the petrol pump, the problem is elsewhere. If petrol is not supplied, remove hose no. 2 and blow pressure of about 1 bar into the hose. This will open the vacuum valve under the tank.
Mount hose no. 2 on the pump and try to start the engine again. If petrol is supplied to hose no. 1, refit it. If not, replace the vacuum valve under the tank.



PREFACE

This manual covers the construction, function and service procedures for the Honda iGX440U engine.

All information contained in this manual is based on the latest product information available at the time of printing. We reserve the right to make changes at anytime without notice.

No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form, by any means, electronic, mechanical, photocopying, recording, or otherwise, without prior written permission of the publisher. This includes text, figures, and tables.

As you read this manual, you will find information that is preceded by a **NOTICE** symbol. The purpose of this message is to help prevent damage to the engine, other property, or the environment.

SAFETY MESSAGES

Your safety, and the safety of others, are very important. To help you make informed decisions, we have provided safety messages and other safety information throughout this manual. Of course, it is not practical or possible to warn you about all the hazards associated with servicing these engine. You must use your own good judgement.

You will find important safety information in a variety of forms, including:

- **Safety Labels** — on the engine.
- **Safety Messages** — Preceded by a safety alert symbol ⚠ and one of three signal words, DANGER, WARNING, or CAUTION.

  These signal words mean:

  ⚠ DANGER You WILL be KILLED or SERIOUSLY HURT if you don't follow instructions.

  ⚠ WARNING You CAN be KILLED or SERIOUSLY HURT if you don't follow instructions.

  ⚠ CAUTION You CAN be HURT if you don't follow instructions.

- **Instructions** — how to service these engines correctly and safely.

Honda Motor Co., Ltd.
Service Publications Office

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1. SPECIFICATIONS
2. PERFORMANCE CURVES
3. DIMENSIONAL DRAWINGS
4. PTO DIMENSIONAL DRAWINGS
5. ENGINE MOUNT DIMENSIONAL DRAWING
6. WIRING DIAGRAMS

1. SPECIFICATIONS

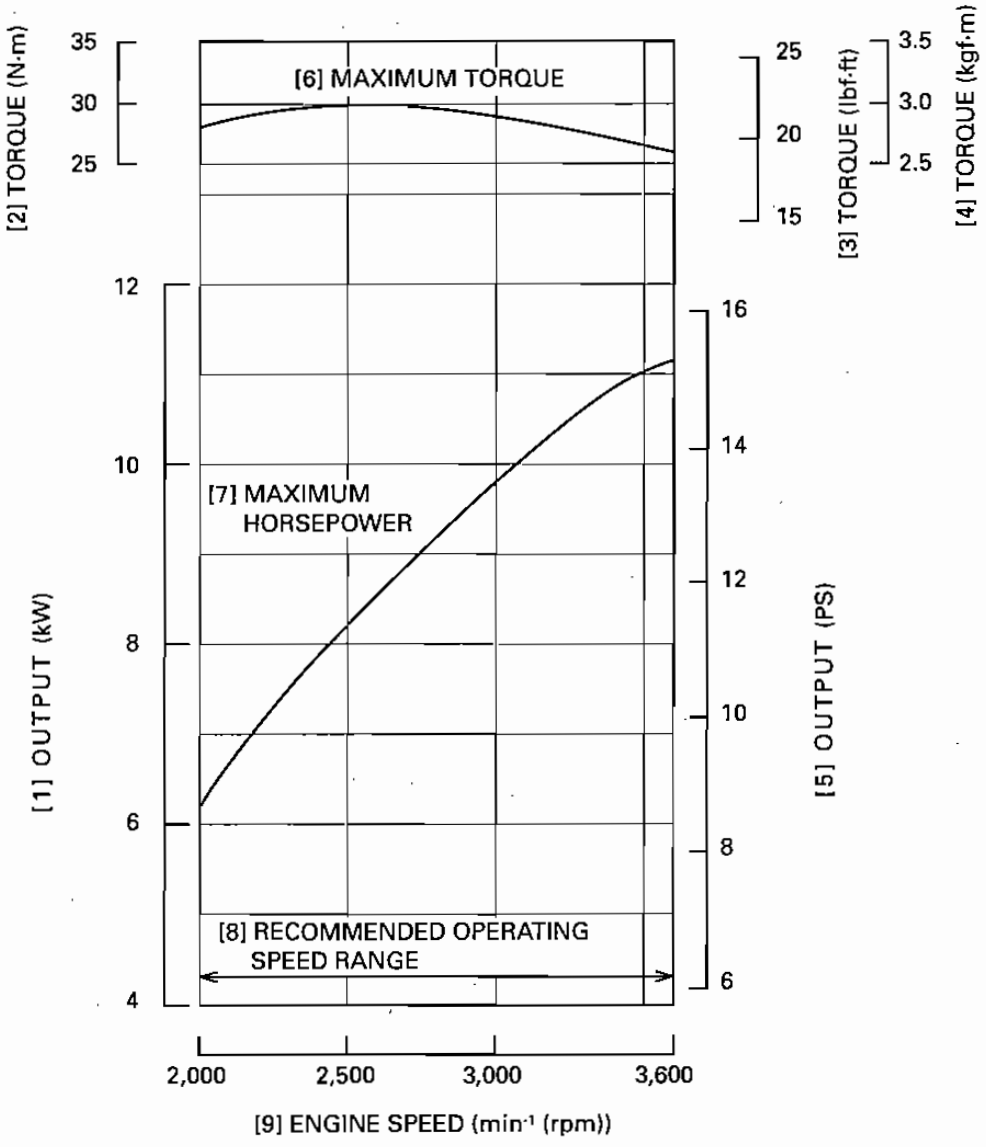
• DIMENSIONS AND WEIGHT

Model	iGX440U		
PTO types	S	Q	V
Overall length	407 mm (16.0 in)	433 mm (17.0 in)	450 mm (17.7 in)
Overall width	505 mm (19.9 in)		
Overall height	454 mm (17.9 in)		
Maximum angle of inclination	20°		
Dry weight	39 kg (86 lbs)		
Operating weight	45 kg (99 lbs)		

• ENGINE

Model	iGX440U
Description code	GCAWK
Type	4-stroke, overhead camshaft, single cylinder, inclined by 15°
Displacement	438 cm^3 (26.7cu-in)
Bore x stroke	88.0 x 72.1 mm (3.46 x 2.84 in)
Maximum horsepower	11.2 kW (15.2 PS)/3,600 min^{-1} (rpm)
Recommended maximum operation bhp	8.0 kW (10.8 PS)/3,600 min^{-1} (rpm)
Maximum torque	29.8 N·m (3.0 kgf·m, 22 lbf·ft)/2,500 min^{-1} (rpm)
Compression ratio	8.1 : 1
Minimum fuel consumption	328 g/kW·h (241 g/PS·h, 0.53 lb/PS·h)
Ignition system	CDI
Ignition timing (at no load)	10° B.T.D.C./1,400 min^{-1} (rpm) 13° B.T.D.C./3,600 min^{-1} (rpm)
Spark plug	BKR7E-E (NGK), K22PR-UR (DENSO)
Lubrication system	Forced splash type
Oil capacity	1.10 ℓ (1.16 US qt, 0.97 Imp qt)
Cooling system	Forced air
Starting system	Recoil and starter motor
Stopping system	Ignition primary circuit open
Carburetor	Horizontal type batterfly valve
Air cleaner	Dual element type
Governor	STR (Self Tuning Regulator) governor
Fuel used	Unleaded gasoline with a pump octane rating 86 or higher
Fuel tank capacity	6.5 ℓ (1.72 US gal, 1.43 Imp gal)

2. PERFORMANCE CURVES



2. COURBES DE PERFORMANCES

[1] PUISSANCE (kW)
[2] COUPLE (N·m)
[3] COUPLE (lbf·pi)
[4] COUPLE (kgf·m)
[5] PUISSANCE (PS)
[6] COUPLE MAXIMUM
[7] PUISSANCE MAXIMALE
[8] PLAGE DES REGIMES DE SERVICE RECOMMANDES
[9] REGIME MOTEUR (min⁻¹ (tr/mn))

2. LEISTUNGSKURVEN

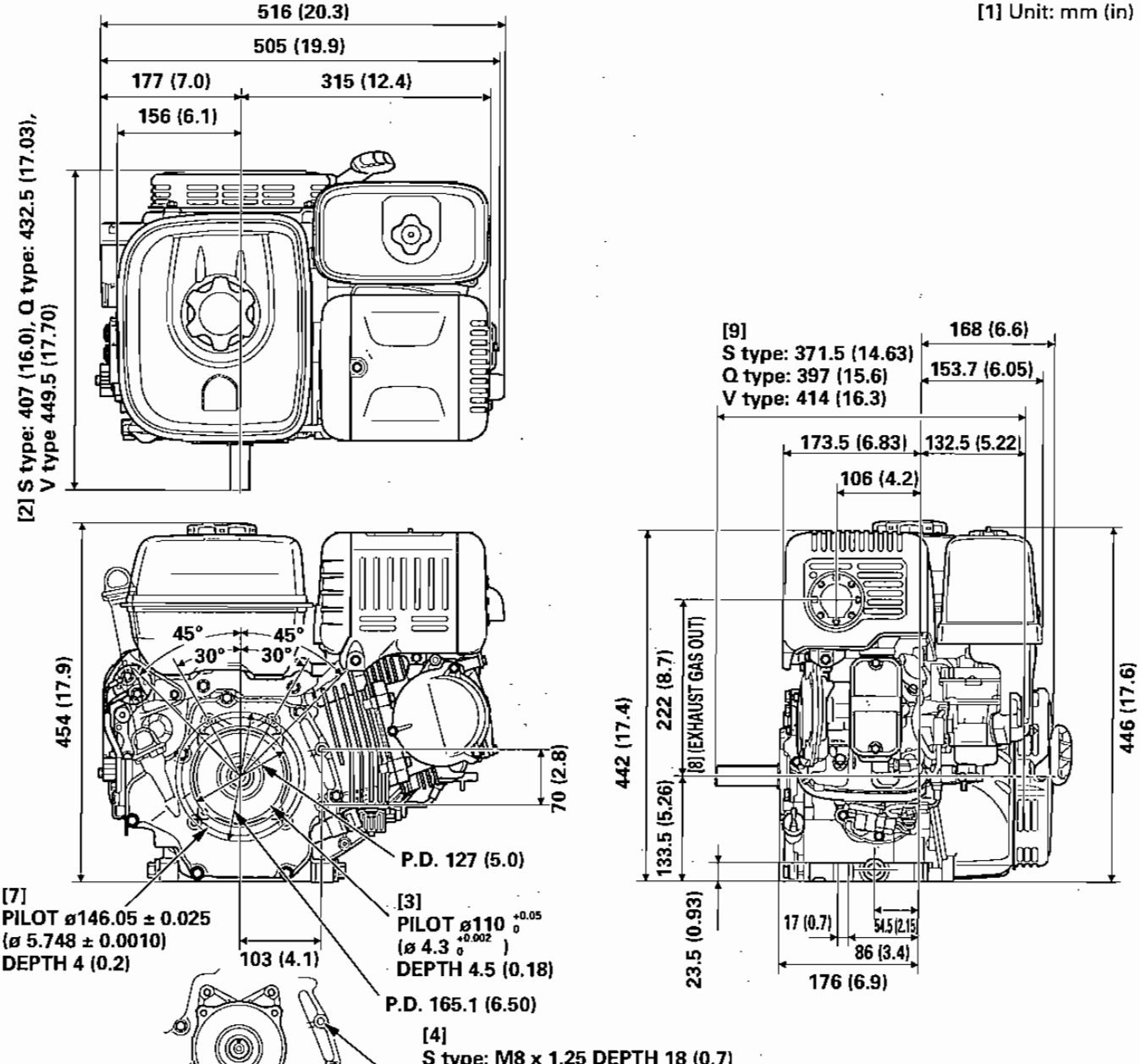
[1] LEISTUNG (kW)
[2] DREHMOMENT (N·m)
[3] DREHMOMENT (lbf·ft)
[4] DREHMOMENT (kp·m)
[5] LEISTUNG (PS)
[6] MAX. DREHMOMENT
[7] HÖCHSTLEISTUNG
[8] EMPFOHLENER BETRIEBSDREHZAHLBEREICH
[9] MOTORDREHZAHL (min⁻¹ (U/min))

2. CURVAS DE RENDIMIENTO

[1] SALIDA (kW)
[2] TORSIÓN (N·m)
[3] TORSIÓN (lbf·pie)
[4] TORSIÓN (kgf·m)
[5] SALIDA (CV)
[6] TORSIÓN MÁXIMA
[7] POTENCIA MÁXIMA EN CABALLOS
[8] MARGEN DE VELOCIDADES DE OPERACIÓN RECOMENDADAS
[9] VELOCIDAD DEL MOTOR (rpm)

3. DIMENSIONAL DRAWINGS

[1] Unit: mm (in)



3. PLANS COTES

[1] Unité: mm
[2] Type S: 407, Type Q: 432,5, Type V 449,5
[3] AVANT-TROU ø 110 +0,05/0
PROFONDEUR 4,5
[4] Type S : M8 x 1,25 PROFONDEUR 18
Type Q: TARAUDAGE 6-5/16-24 UNC-2B
Type V : TARAUDAGE 6-5/16-24 UNC-2B
[5] Type S : M8 x 1,25 PROFONDEUR 18
Type Q: TARAUDAGE 6-5/16-24 UNC-2B
Type V : TARAUDAGE 6-5/16-24 UNC-2B (4PLCS)
[6] Type S : ø 8,51 +0,4/0
Type Q: TARAUDAGE 4-3/8-16 UNC-2B
Type V : TARAUDAGE 4-3/8-16 UNC-2B (4PLCS)
[7] AVANT-TROU ø 146,05 ± 0.025
PROFONDEUR 4
[8] (SORTIE DES GAZ D'ECHAPPEMENT)
[9] Type S : 371,5
Type Q : 397
Type V : 414

3. MAßZEICHNUNGEN

[1] Einheit: mm
[2] S-Typ: 407, Q-Typ: 432,5, V-Typ 449,5
[3] FÜHRUNG ø110 +0,05/0
TIEFE 4,5
[4] S-Typ : M8 x 1,25 TIEFE 18
Q-Typ : 6-5/16-24 UNC-2B BOHRUNG
V-Typ : 6-5/16-24 UNC-2B BOHRUNG
[5] S-Typ : M8 x 1,25 TIEFE 18
Q-Typ : 6-5/16-24 UNC-2B BOHRUNG
V-Typ : 6-5/16-24 UNC-2B BOHRUNG (4PLCS)
[6] S-Typ : ø 8,51 +0,4/0
Q-Typ : 4-3/8-16 UNC-2B BOHRUNG
V-Typ : 4-3/8-16 UNC-2B BOHRUNG (4PLCS)
[7] FÜHRUNG ø146,05 ± 0.025
TIEFE 4
[8] (ABGASAUSLASS)
[9] S-Typ : 371,5
Q-Typ : 397
V-Typ : 414

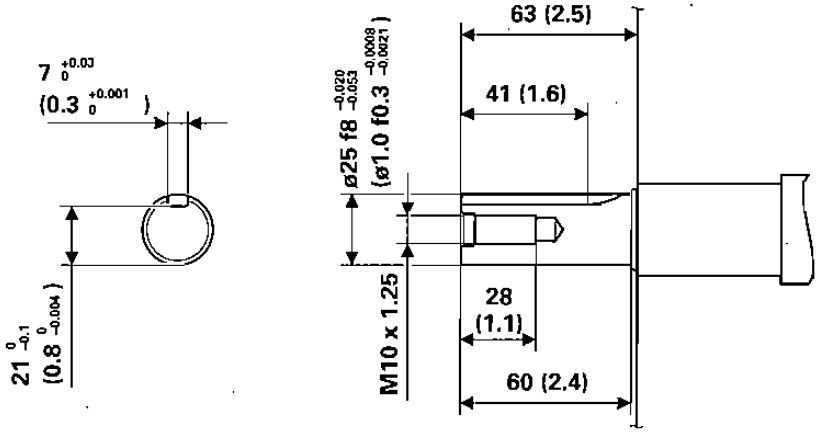
3. PLANOS DE DIMENSIONES

[1] Unidad: mm
[2] Tipo S: 407, Tipo Q: 432,5, Tipo V: 449,5
[3] PILOTO DE ø 110 + 0,05/0
PROFUNDIDAD DE 4,5
[4] Tipo S : M8 x 1,25 18 DE PROFUNDIDAD
Tipo Q : MACHO DE ROSCAR 6-5/16-24 UNC-2B
Tipo V : MACHO DE ROSCAR 6-5/16-24 UNC-2B
[5] Tipo S : M8 x 1,25 18 DE PROFUNDIDAD
Tipo Q : MACHO DE ROSCAR 6-5/16-24 UNC-2B
Tipo V : MACHO DE ROSCAR 6-5/16-24 UNC-2B (4PLCS)
[6] Tipo S : ø 8,51 +0,4/0
Tipo Q : MACHO DE ROSCAR 4-3/8-16 UNC-2B
Tipo V : MACHO DE ROSCAR 4-3/8-16 UNC-2B (4PLCS)
[7] PILOTO de ø146,05 ± 0,025
PROFUNDIDAD DE 4
[8] (SALIDA DE GASES DE ESCAPE)
[9] Tipo S : 371,5
Tipo Q : 397
Tipo V : 414

4. PTO DIMENSIONAL DRAWINGS

[1] Unit: mm (in)

<S type>



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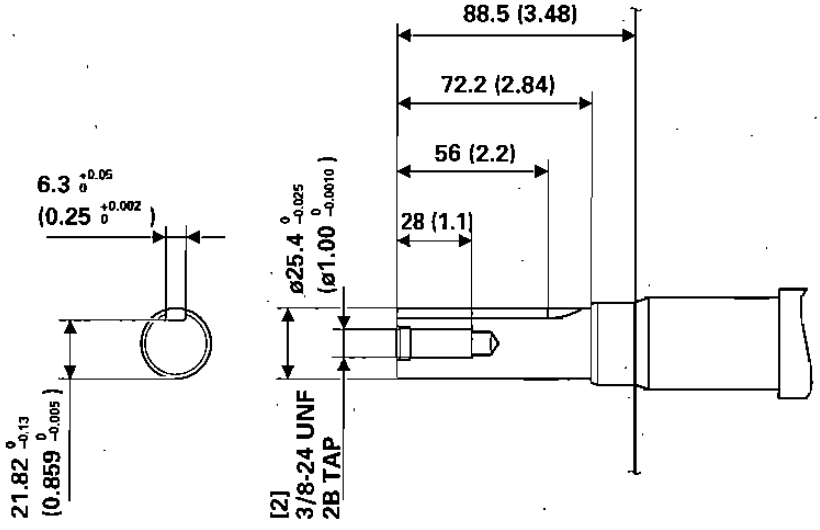
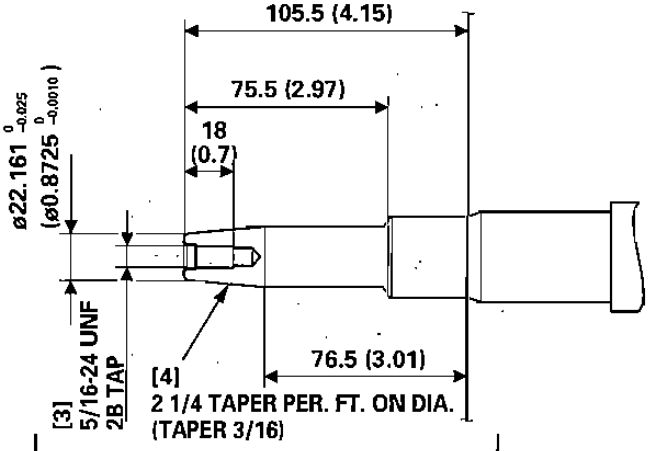


<V type>



4. PLANS COTES DE LA PRISE DE FORCE

[1] Unité: mm
<Type S>

<Type Q>
[2] TARAUDAGE 3/8-24 UNF 2B

<Type V>
[3] TARAUDAGE 5/16-24 UNF2B
[4] CONICITE DE 2 1/4 PAR PIED SUR LE DIAMETRE (CONICITE 3/16)

4. ABTRIEB-MAßZEICHNUNGEN

[1] Einheit: mm
<S-Typ>

<Q-Typ>
[2] 3/8-24 UNF 2B BOHRUNG

<V-Typ>
[3] 5/16-24 UNF2B BOHRUNG
[4] 2 1/4 KONIZITÄT PRO FUß AUF DURCHM. (KONUS 3/16)

4. PLANOS DE DIMENSIONES DE LA TOMA DE FUERZA

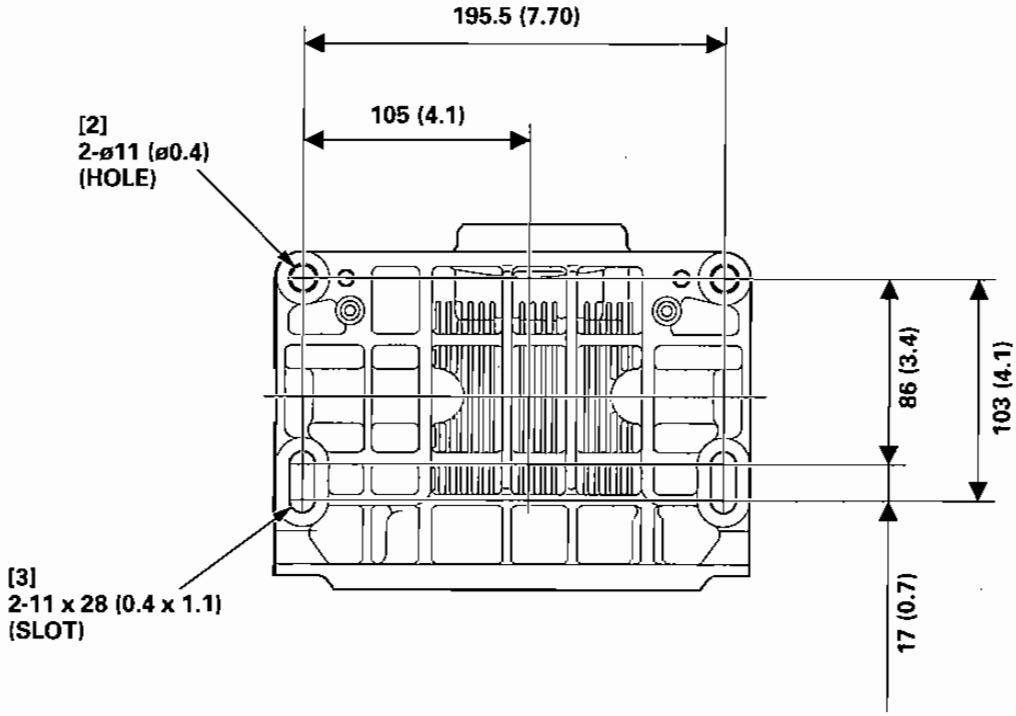
[1] Unidad: mm
<Tipo S>

<Tipo Q>
[2] MACHO DE ROSCAR 3/8-24 UNF 2B

<Tipo V>
[3] MACHO DE ROSCAR 5/16-24 UNF2B
[4] CONICIDAD DE 2 1/4 POR PIE EN EL DIÁMETRO (CONICIDAD DE 3/16)

5. ENGINE MOUNT DIMENSIONAL DRAWING

[1] Unit: mm (in)



5. PLAN COTE DE MONTAGE DU MOTEUR

[1] Unité: mm
[2] 2-ø 11
(ORIFICE)
[3] 2-11 x 28
(FENTE)

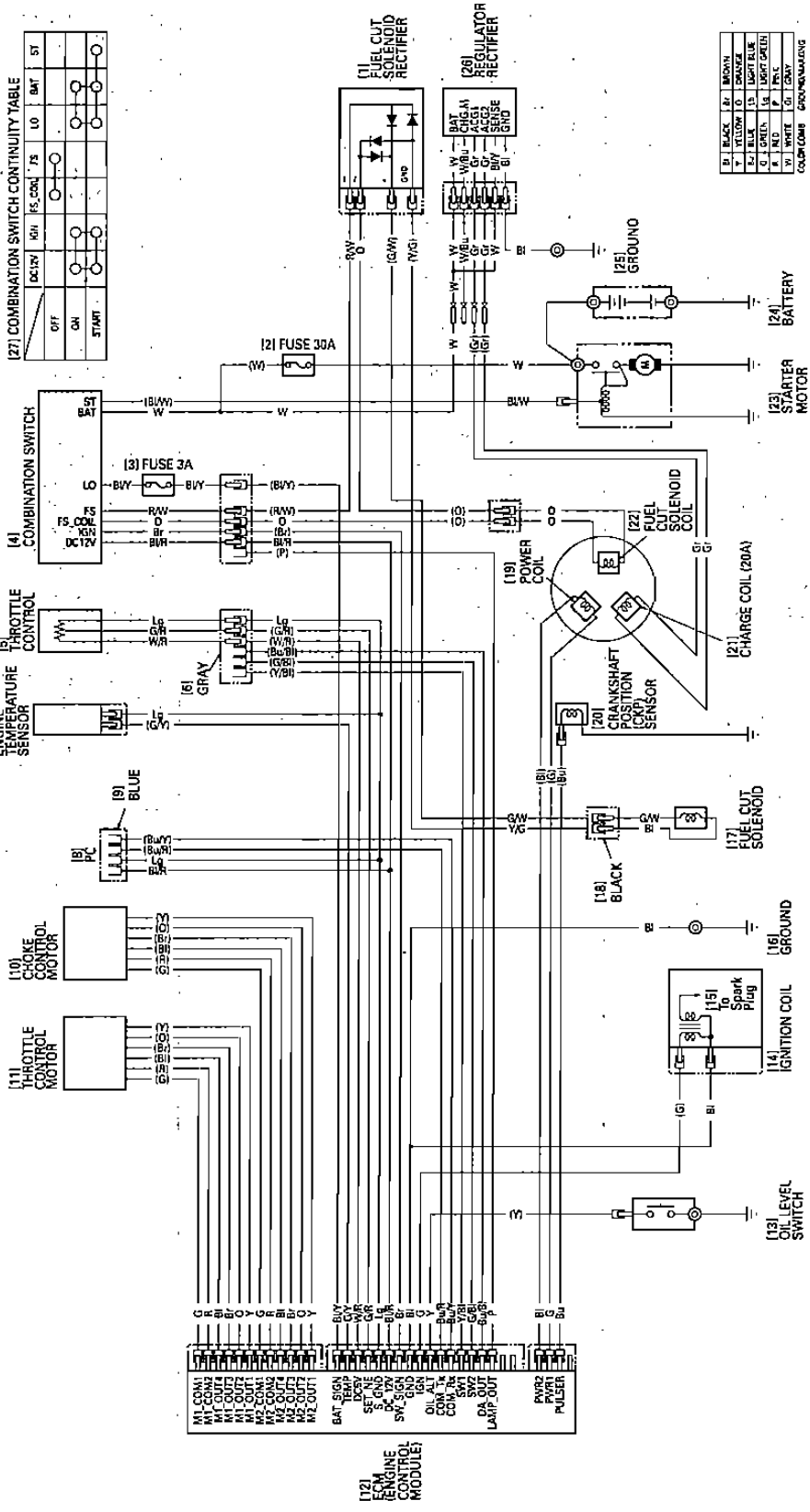
5. MOTORLAGERUNG-MAßZEICHNUNG

[1] Einheit: mm
[2] 2-ø11
(LOCH)
[3] 2-11 x 28
(NUT)

5. PLANO DE DIMENSIONES DE LA MONTURA DEL MOTOR

[1] Unidad: mm
[2] 2-ø11
(ORIFICIO)
[3] 2-11 x 28
(RANURA)

With starter motor and charge coil (20A) type



2. SERVICE INFORMATION

1. THE IMPORTANCE OF PROPER SERVICING
2. IMPORTANT SAFETY PRECAUTIONS
3. SERVICE RULES
4. SYMBOLS USED IN THIS MANUAL
5. SERIAL NUMBER LOCATION
6. MAINTENANCE STANDARDS
7. TORQUE VALUES
8. SPECIAL TOOLS
9. TROUBLESHOOTING
10. HARNESS ROUTING
11. TUBE ROUTING

1. THE IMPORTANCE OF PROPER SERVICING

Proper servicing is essential to the safety of the operator and the reliability of the engine. Any error or oversight made by the technician while servicing can easily result in faulty operation, damage to the engine, or injury to the operator.

⚠ WARNING

Improper servicing can cause an unsafe conditon that can lead to serious injury or death.

Follow the procedures and precautions in this shop manual carefully.

Some of the most important precautions are given below. However, we cannot warn you of every conceivable hazard that can arise in performing maintenance or repairs. Only you can decide whether or not you should perform a given task.

⚠ WARNING

Failure to follow properly follow maintenance instructions and precautions can cause you to be seriously hurt or killed.

Follow the procedures and precautions in this shop manual carefully.

2. IMPORTANT SAFETY PRECAUTIONS

Make sure you have a clear understanding of all basic shop safety practices and that you are wearing appropriate clothing and using safety equipment. When performing any service task, be especially careful of the following:

- Read all of the instructions before you begin, and make sure you have the tools, the replacement or repair parts, and the skills required to perform the tasks safely and completely.
- Protect your eyes by using proper safety glasses, goggles, or face shields any time you hammer, drill, grind, or work around pressurized air or or liquids, and springs or other stored-energy components. If there is any doubt, put on eye protection.
- Use other protective wear when necessary, for example, gloves or safety shoes. Handling hot or sharp parts can cause severe burns or cuts. Before you grab something that looks like it can hurt you, stop and put on gloves.

Make sure the engine is off before you begin any servicing procedures, unless the instruction tells you to do otherwise. This will help eliminate several potential hazards:

- Carbon monoxide poisoning from engine exhaust. Be sure there is adequate ventilation whenever you run the engine.
- Burns from hot parts. Let the engine and exhaust system cool before working in those areas.
- Injury from moving parts. If the instruction tells you to run the engine, be sure your hands, fingers, and clothing are out of the way.

Gasoline vapors are explosive. To reduce the possibility of a fire or explosion, be careful when working around gasoline or batteries.

- Use only a nonflammable solvent, not gasoline, to clean parts.
- Never drain or store gasoline in an open container.
- Keep all cigarettes, sparks, and flames away from all fuel-related parts.

3. SERVICE RULES

1. Use genuine Honda or Honda-recommended parts and lubricants or their equivalents. Parts that do not meet Honda's design specifications may damage to the unit.
2. Use the special tools designed for the product.
3. Install new gaskets, O-rings, etc. when reassembling.
4. When torquing bolts or nuts, begin with larger-diameter or inner bolts first and tighten to the specified torque diagonally, unless a particular sequence is specified.
5. Clean parts in cleaning solvent upon disassembly. Lubricate any sliding surfaces before reassembly.
6. After reassembly, check all parts for proper installation and operation.
7. Many screws used in this machine are self-tapping. Be aware that cross-threading or overtightening these screws will strip the threads and ruin the hole.
8. Use only metric tools when servicing this unit. Metric bolts, nuts and screws are not interchangeable with non-metric fasteners. The use of incorrect tools and fasteners will damage the unit.

4. SYMBOLS USED IN THIS MANUAL

As you read this manual, you may find the following symbols with the instructions.

A special tool is required to perform the procedure.

Apply grease.

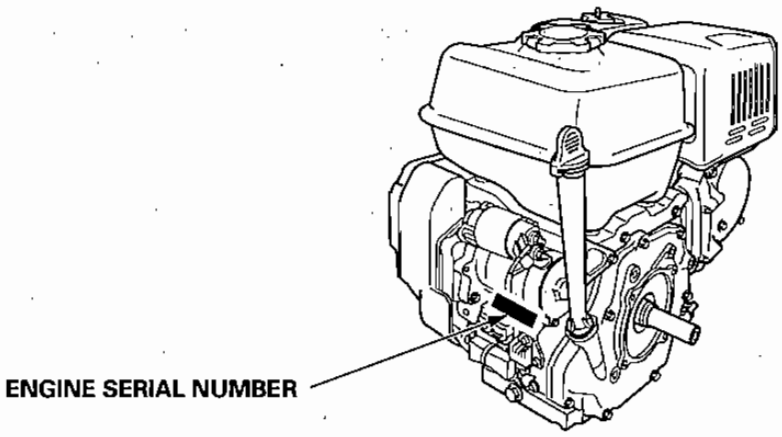
Apply oil.

O x O (O) Indicates the diameter, length, and quantity of metric flange bolts used.

P. O-O Indicates the reference page.

5. SERIAL NUMBER LOCATION

The engine serial number is stamped on the cylinder barrel. Refer to this when ordering parts or making technical inquiries.



6. MAINTENANCE STANDARDS

Unit: mm (in)

Part	Item		Standard	Service Limit
Engine	Maximum speed (No load)		3,600 min^{-1} (rpm)*	———
	Idle speed		1,400 $^{+150}_{0}$ min^{-1} (rpm)*	———
	Cylinder compression		0.39-0.68 Mpa (4-7 kgf/cm², 57-100 psi) at 600 min^{-1} (rpm)	———
Cylinder	Sleeve I.D.		88.000-88.017 (3.4646-3.4652)	88.120 (3.4693)
Cylinder head	Warpage		———	0.10 (0.004)
Piston	Skirt O.D.		87.985-87.965 (3.4640-3.4632)	87.850 (3.4587)
	Piston-to-cylinder clearance		0.015-0.052 (0.0006-0.0020)	0.120 (0.0047)
	Piston pin bore I.D.		21.002-21.008 (0.8268-0.8271)	21.040 (0.8283)
	Piston pin O.D.		21.000-20.994 (0.8268-0.8265)	20.970 (0.8256)
	Piston pin-to-piston pin bore clearance		0.002-0.014 (0.0001-0.0006)	0.050 (0.0020)
Piston ring	Ring side clearance	Top/second	0.030-0.055 (0.0012-0.0022)	0.150 (0.0059)
	Ring end gap	Top	0.20-0.35 (0.008-0.014)	1.00 (0.0394)
		Second	0.35-0.50 (0.014-0.020)	1.00 (0.0394)
	Ring width	Top/second	1.490-1.475 (0.0587-0.0581)	1.250 (0.0492)
Connecting rod	Small end I.D.		21.005-21.020 (0.8270-0.8276)	21.070 (0.8295)
	Big end I.D.		40.025-40.039 (1.5758-1.5763)	40.070 (1.5776)
	Big end oil clearance		0.040-0.064 (0.0016-0.0025)	0.120 (0.0047)
	Big end side clearance		0.1-0.4 (0.004-0.016)	1.0 (0.039)
Crankshaft	Crank pin O.D.		39.985-39.975 (1.5742-1.5738)	39.930 (1.5720)
Valve	Valve clearance	IN	0.12 ± 0.02	———
		EX	0.15 ± 0.02	———
	Stem O.D.	IN	5.490-5.478 (0.2161-0.2157)	5.400 (0.2126)
		EX	5.450-5.435 (0.2146-0.2140)	5.300 (0.2087)
	Guide I.D.	IN/EX	5.500-5.512 (0.2165-0.2170)	5.560 (0.2189)
	Stem-to-guide clearance	IN	0.010-0.034 (0.0004-0.0013)	0.110 (0.0043)
		EX	0.050-0.077 (0.0020-0.0030)	0.130 (0.0051)
	Seat width	IN	0.900-1.100 (0.0354-0.0433)	2.000 (0.0787)
		EX	1.200-1.400 (0.0472-0.0551)	2.300 (0.0906)
	Valve spring free length		46.3 (1.82)	44.8 (1.76)
Camshaft	Cam height	IN	31.136-30.736 (1.2258-1.2101)	30.586 (1.2042)
		EX	30.545-30.145 (1.2026-1.1868)	29.995 (1.1809)
	Journal O.D.		21.500-21.470 (0.8465-0.8453)	21.400 (0.8425)
Cylinder head	Camshaft holder I.D.		21.500-21.521 (0.8465-0.8473)	21.550 (0.8484)
Carburetor	Main jet		#112	———
	Pilot screw opening		1-5/8 turns out	———
	Float height		13.2 (0.52)	———
Spark plug	Gap		0.7-0.8 (0.028-0.031)	———
Ignition coil	Resistance	Primary coil	0.16-0.21 Ω	———
		Secondary coil	3.74-4.58 kΩ	———
Starter motor	Brush length		10.0 (0.39)	6.0 (0.24)
	Mica depth		———	0.2 (0.01)

*: This figure is caused by basic program in the ECM. The engine speed is different depending on the program in the ECM.

7. TORQUE VALUES

Item	Thread Dia. (mm)	Torque valves		
		N·m	kgf·m	lbf·ft
Crankcase cover bolt	M8 x 1.25	24	2.4	18
Bearing holder bolt	M8 x 1.25	26	2.6	19
Oil drain bolt	M20 x 1.5	45	4.5	33
Cylinder head bolt	M10 x 1.25	35	3.5	26
Cam pulley bolt	M6 x 1.0	16	1.6	12
Spark plug	M14 x 1.25	18	1.8	13
Engine temperature sensor	M10 x 1.25	12	1.2	9
Connecting rod bolt	M8 x 1.25	14	1.4	10
Valve adjusting screw lock nut	M5 x 0.5	7.5	0.75	5.5
Rocker arm shaft bolt	M12 x 1.25	23	2.3	17
Air cleaner elbow nut	M6 x 1.0	10	1.0	7
Flywheel nut	M16 x 1.5	165	16.8	122
Starter motor nut	M8 x 1.25	8.8	0.9	6.5
Electric parts cover screw	M5 x 20 mm self-tapping screw	1.7	0.17	1.3
Control panel screw	M5 x 20 mm self-tapping screw	1.7	0.17	1.3
Control box bracket	M5 x 14 mm self-tapping screw	1.7	0.17	1.3
Combination switch lock nut	M18 x 1.0	13	1.3	10
Throttle control nut	M10 x 0.75	1.1	0.11	0.81
Fuel strainer cup	—	3.9	0.4	2.9
Throttle/choke control motors screw	M3 x 6 mm screw washer	0.88	0.09	0.65
Motor plate screw	M5 x 20 mm pan screw	4.9	0.5	3.6
ECM cover screw	M4 x 10 mm screw washer	2.1	0.2	1.5

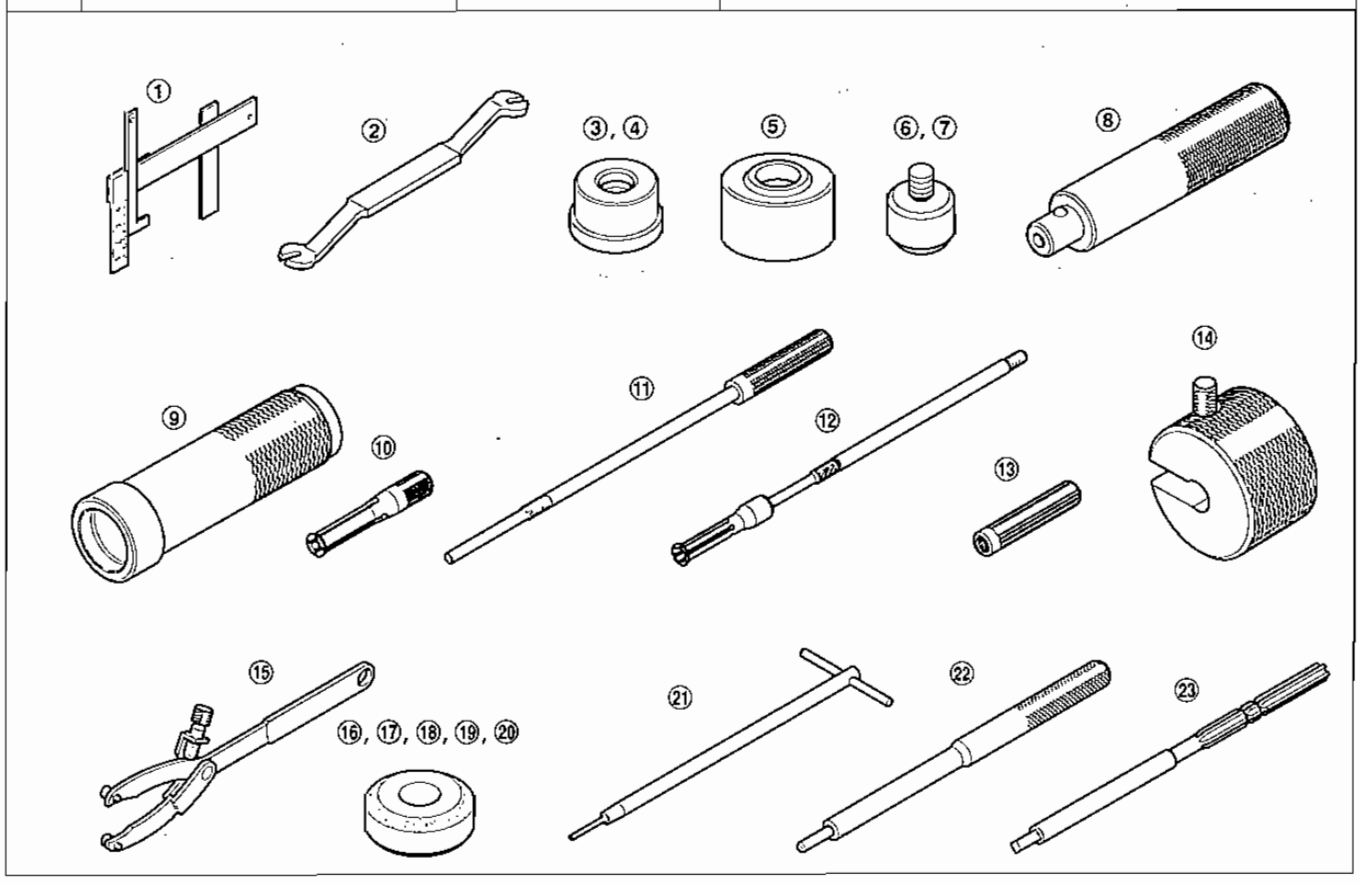
- CT (Cutting Thread) indicates a self-tapping bolt.
- Use standard torque values for fasteners that are not listed in this table.

STANDARD TORQUE VALUES

Item	Thread Dia. (mm)	Torque valves		
		N·m	kgf·m	lbf·ft
Screw	4 mm	2.1	0.2	1.5
	5 mm	4.3	0.4	3.2
	6 mm	9.0	0.9	6.6
Bolt and nut	5 mm	5.3	0.5	3.9
	6 mm	10	1.0	7
	8 mm	22	2.2	16
	10 mm	34	3.5	25
	12 mm	54	5.5	40
Flange bolt and nut	5 mm	5.3	0.5	3.9
	6 mm	12	1.2	9
	8 mm	23	2.3	17
	10 mm	40	4.1	30
CT flange bolt (Retightening)	5 mm	5.4	0.6	4.0
	6 mm	12	1.2	9

8. SPECIAL TOOLS

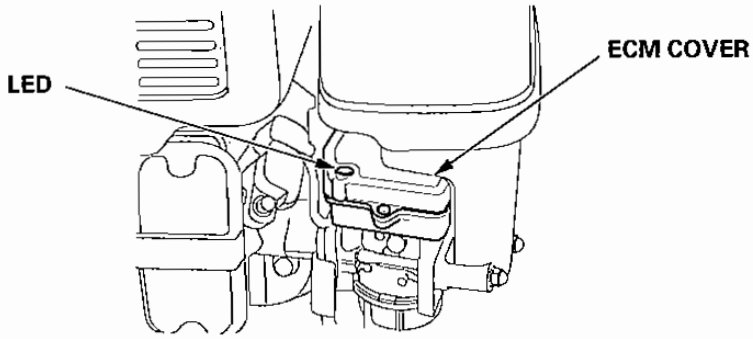
No.	Tool name	Tool number	Application
①	Float level gauge	07401-0010000	Carburetor float height inspection
②	Tappet adjust wrench 3 x 4 mm	07908-KE90000	Valve clearance adjustment
③	Attachment 32 x 35 mm	07746-0010100	Balancer bearing installation, camshaft bearing removal/installation
④	Attachment 52 x 55 mm	07746-0010400	35 x 52 x 8 mm oil seal installation
⑤	Inner bearing driver attachment 15 mm	07746-0020200	Camshaft bearing removal
⑥	Pilot 15 mm	07746-0040300	Balancer bearing (Bearing holder side) installation
⑦	Pilot 17 mm	07746-0040400	Balancer bearing (Crankcase side) installation, camshaft bearing removal/installation
⑧	Driver	07749-0010000	Handle for ③, ④, ⑥, ⑦
⑨	Inner driver handle 40	07746-0030100	Crankshaft bearing installation
⑩	Bearing remover head 15	07936-KC10200	Balancer bearing (Bearing holder side) removal
⑪	Bearing remover shaft 15	07936-KC10100	Balancer bearing (Bearing holder side) removal
⑫	Bearing remover shaft set 17	07936-3710300	Balancer bearing (Crankcase side) removal
⑬	Bearing remover shaft handle	07936-3710100	Handle for ⑫
⑭	Remover weight	07741-0010201	Balancer bearing removal
⑮	Universal holder	07725-0030000	Cam pulley removal/installation
⑯	Valve seat cutter 45° ø35 mm	07780-0010400	EX valve seat reconditioning
⑰	Valve seat cutter 45° ø40 mm	07780-0010500	IN valve seat reconditioning
⑱	Valve seat cutter 32° ø35 mm	07780-0012300	EX valve seat reconditioning
⑲	Valve seat cutter 32° ø38.5 mm	07780-0012400	IN valve seat reconditioning
⑳	Valve seat cutter 60° ø37.5 mm	07780-0014100	IN/EX valve seat reconditioning
㉑	Cutter holder 5.5 mm	07781-0010101	Valve seat reconditioning
㉒	Valve guide driver 6.7 x 9.8 mm	07942-8230000	Weight center pin of the camshaft installation
㉓	Valve guide reamer 5.510 mm	07984-2000001	Valve guide reaming



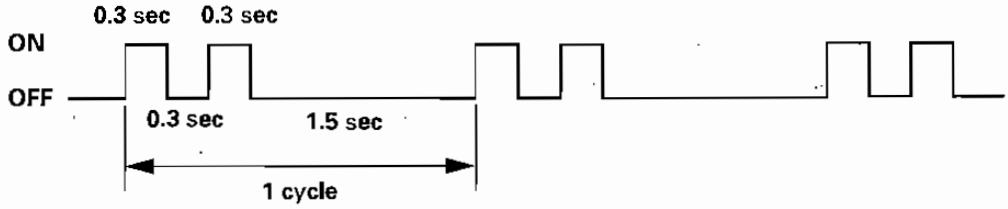
9. TROUBLESHOOTING

<Self-diagnosis as indicated by the LED>

For details about self-diagnosis, please refer to P. 2-7.
When the battery is disconnected, self-diagnosis with the LED is not possible.
For diagnosis when the engine is not equipped with the starter motor or when the battery is disconnected, refer to P. 2-10.



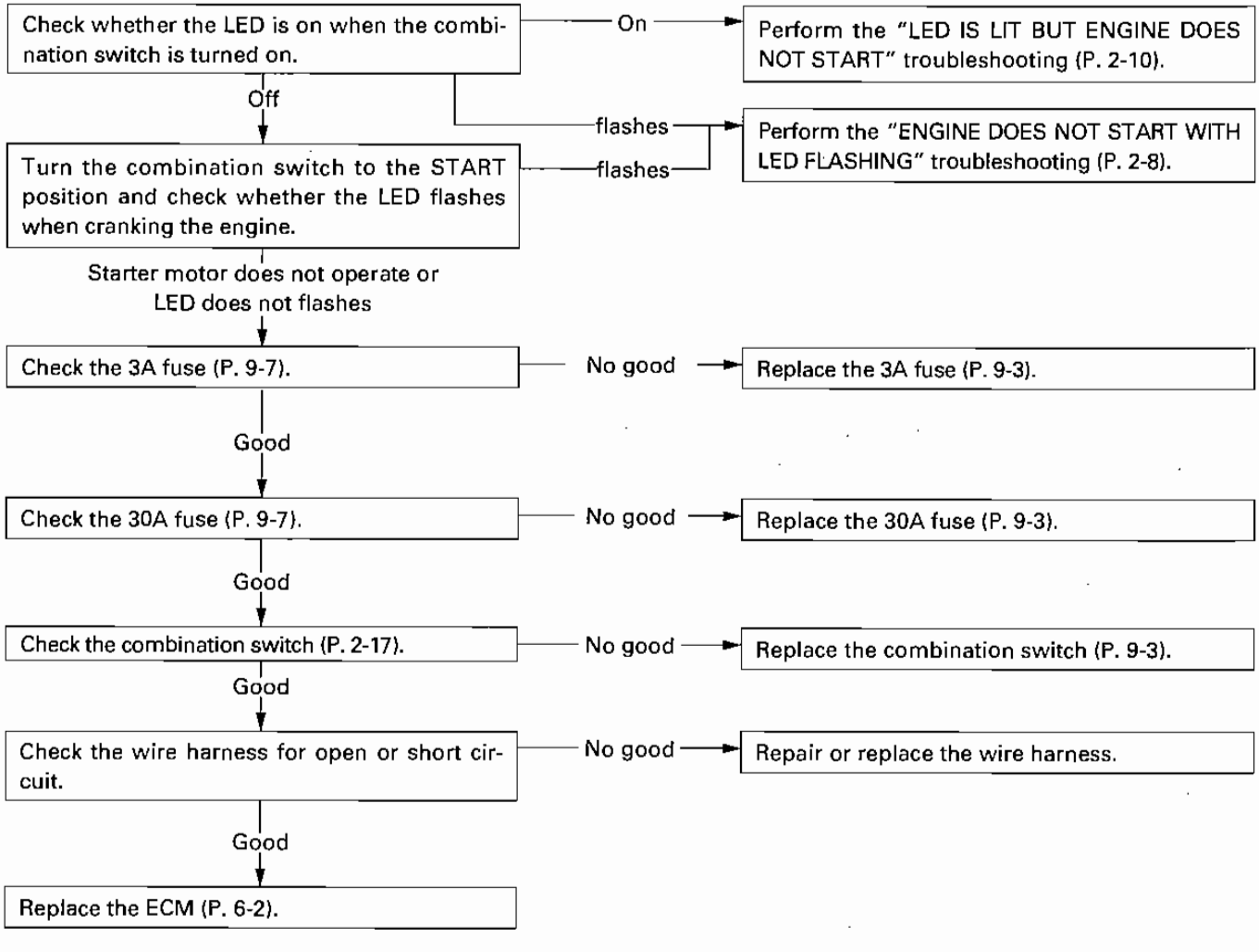
The LED for a failure flashes periodically, as shown in the following figure.
Example: In the case of "2 flashes," the sequence of 0.3 sec. on > 0.3 sec. off > 0.3 sec. on > 1.5 sec. off is repeated as a cycle.



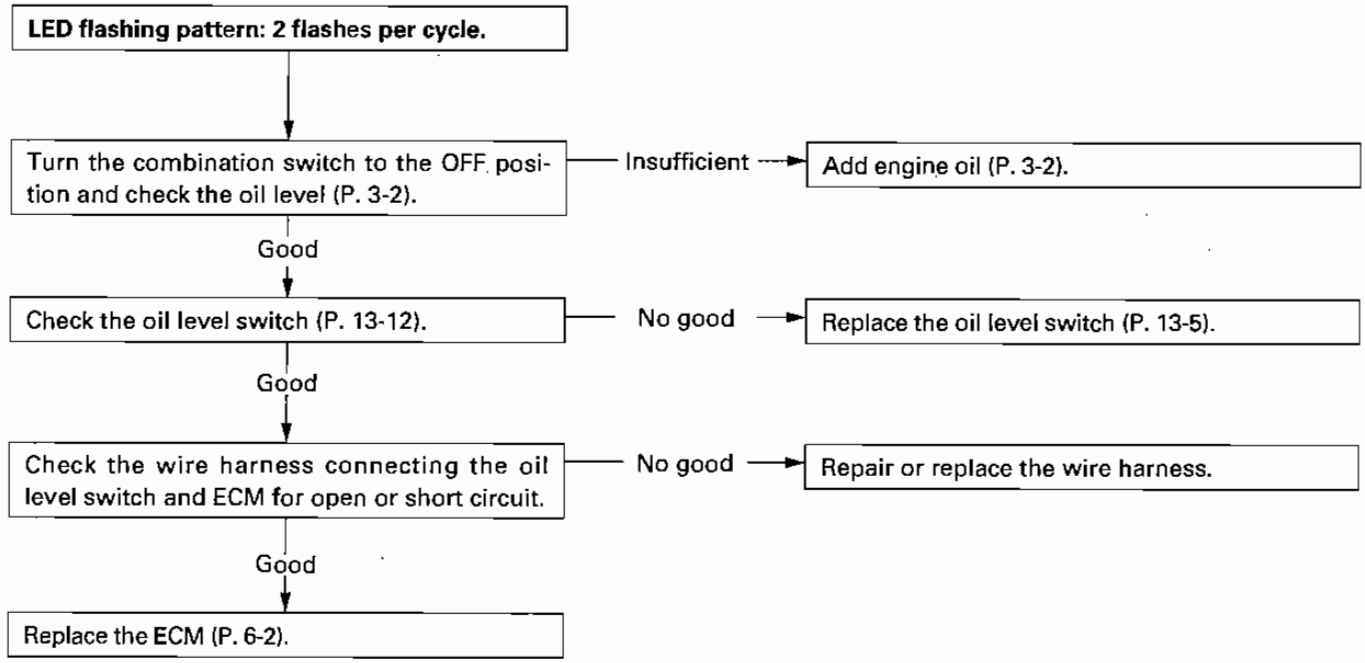
LED status	Possible problems	Engine behavior
LED illuminates	None (Electrical system is normal)	Normal
2 flashes	• Insufficient oil • Oil level switch failure • Wire harness connecting oil level switch and ECM (Engine Control Module) failure • ECM failure	While engine is running: Engine stops. *1 At start up: Engine may or may not start. *1
4 flashes	• Engine temperature sensor failure • Wire harness connecting engine temperature sensor and ECM failure • ECM failure	While engine is running: The engine continues to run.*3 At start up: Engine does not start.
6 flashes	• Power coil failure • Wire harness connecting power coil and ECM failure • ECM failure	While engine is running: Engine stops. At engine start up: Engine does not start.
8 flashes	Program failure*2	While engine is running: Engine stops. At start up: Engine does not start.
LED does not light up	• Battery failure • 3A or 30A fuse blown • Combination switch failure • Wire harness failure • ECM failure	While engine is running: Engine stops. At start up: Engine does not start.

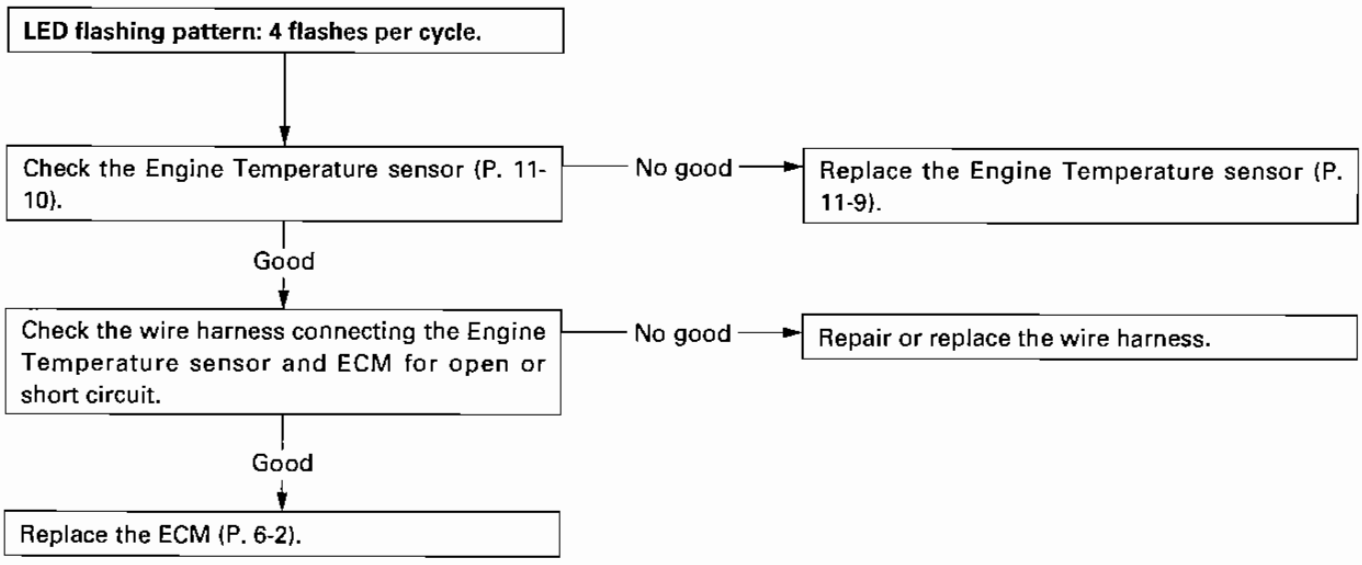
*1: The engine may or may not stop, depending on the program in the ECM.
*2: Rewriting of the program is needed. Contact your Honda engine distributor.
*3: If the faulty engine temperature sensor is detected while engine is running, the engine does not stop and the LED does not flash.
After the engine is stopped, the engine does not start until the faulty engine temperature sensor is solved.

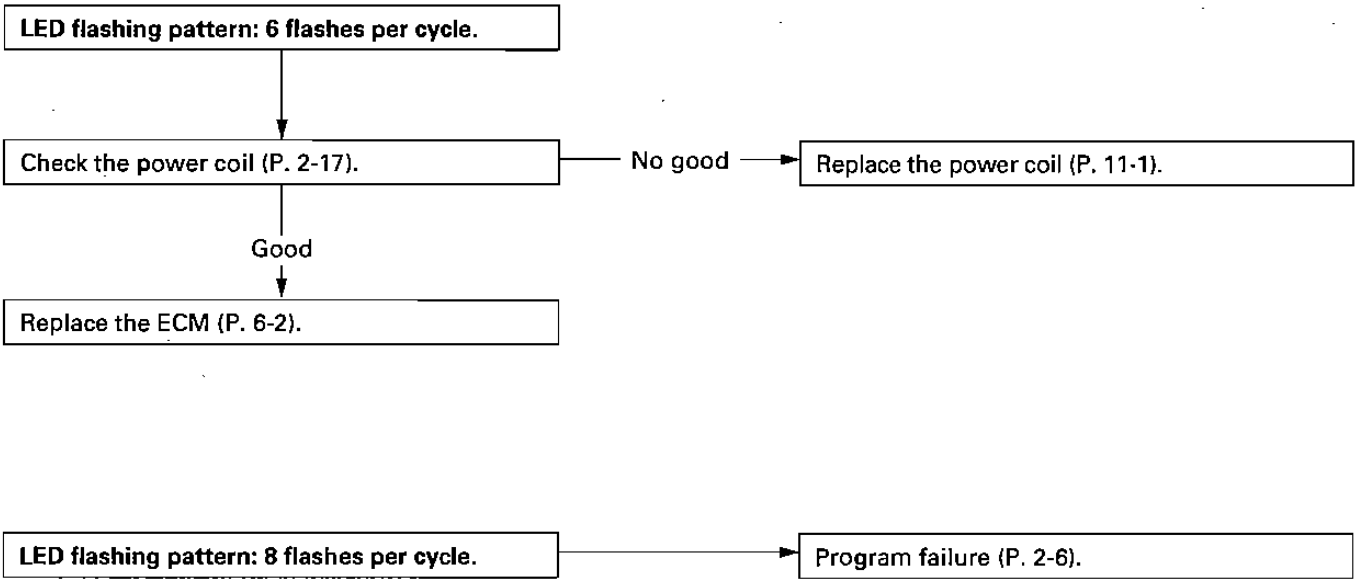
a. ENGINE DOES NOT START (Starter motor equipped type)


Check whether the LED is on when the combination switch is turned on.
On
Perform the "LED IS LIT BUT ENGINE DOES NOT START" troubleshooting (P. 2-10).
Off
flashes
Perform the "ENGINE DOES NOT START WITH LED FLASHING" troubleshooting (P. 2-8).
Turn the combination switch to the START position and check whether the LED flashes when cranking the engine.
flashes
Starter motor does not operate or LED does not flashes
Check the 3A fuse (P. 9-7).
No good
Replace the 3A fuse (P. 9-3).
Good
Check the 30A fuse (P. 9-7).
No good
Replace the 30A fuse (P. 9-3).
Good
Check the combination switch (P. 2-17).
No good
Replace the combination switch (P. 9-3).
Good
Check the wire harness for open or short circuit.
No good
Repair or replace the wire harness.
Good
Replace the ECM (P. 6-2).

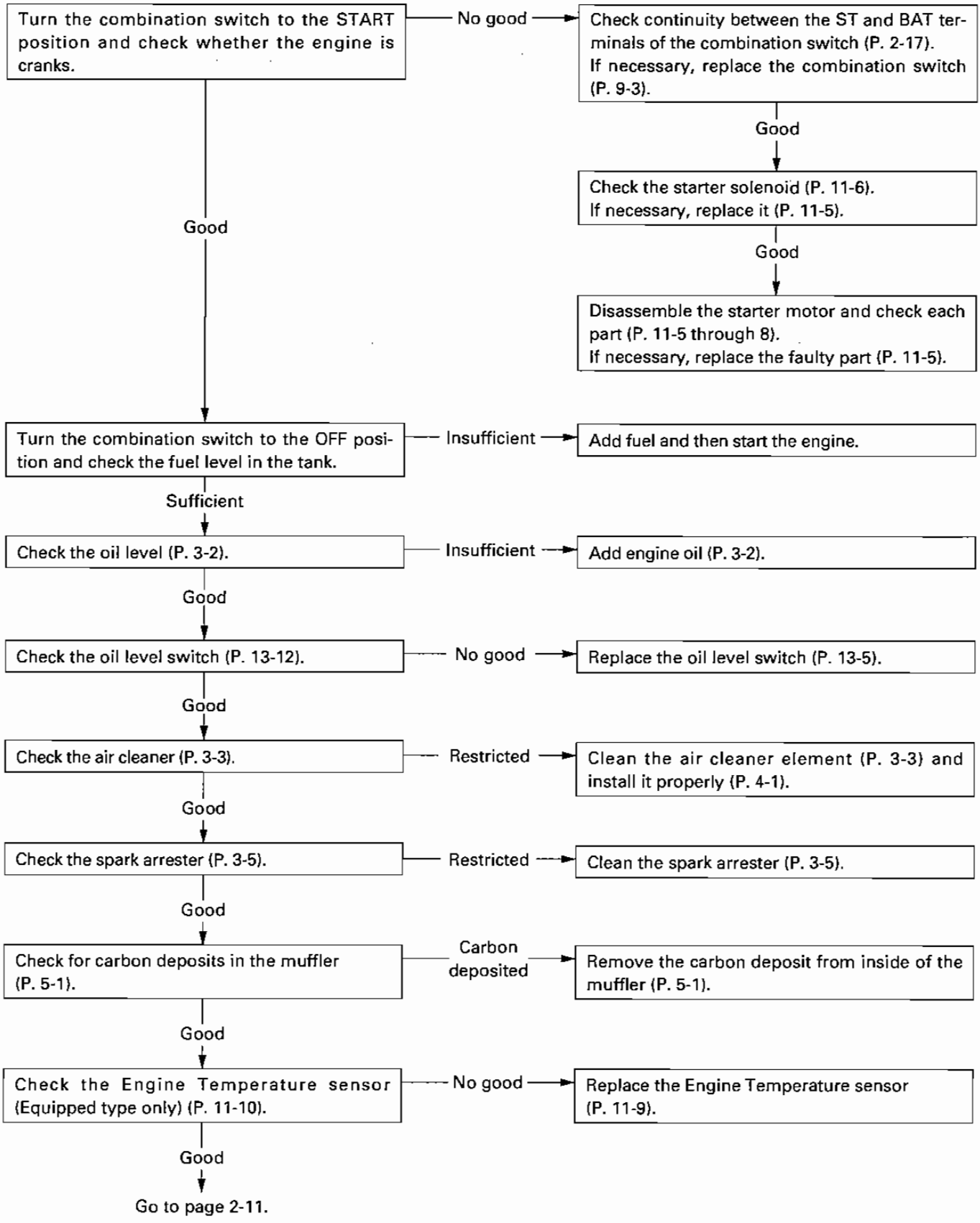
b. ENGINE DOES NOT START WITH LED FLASHING

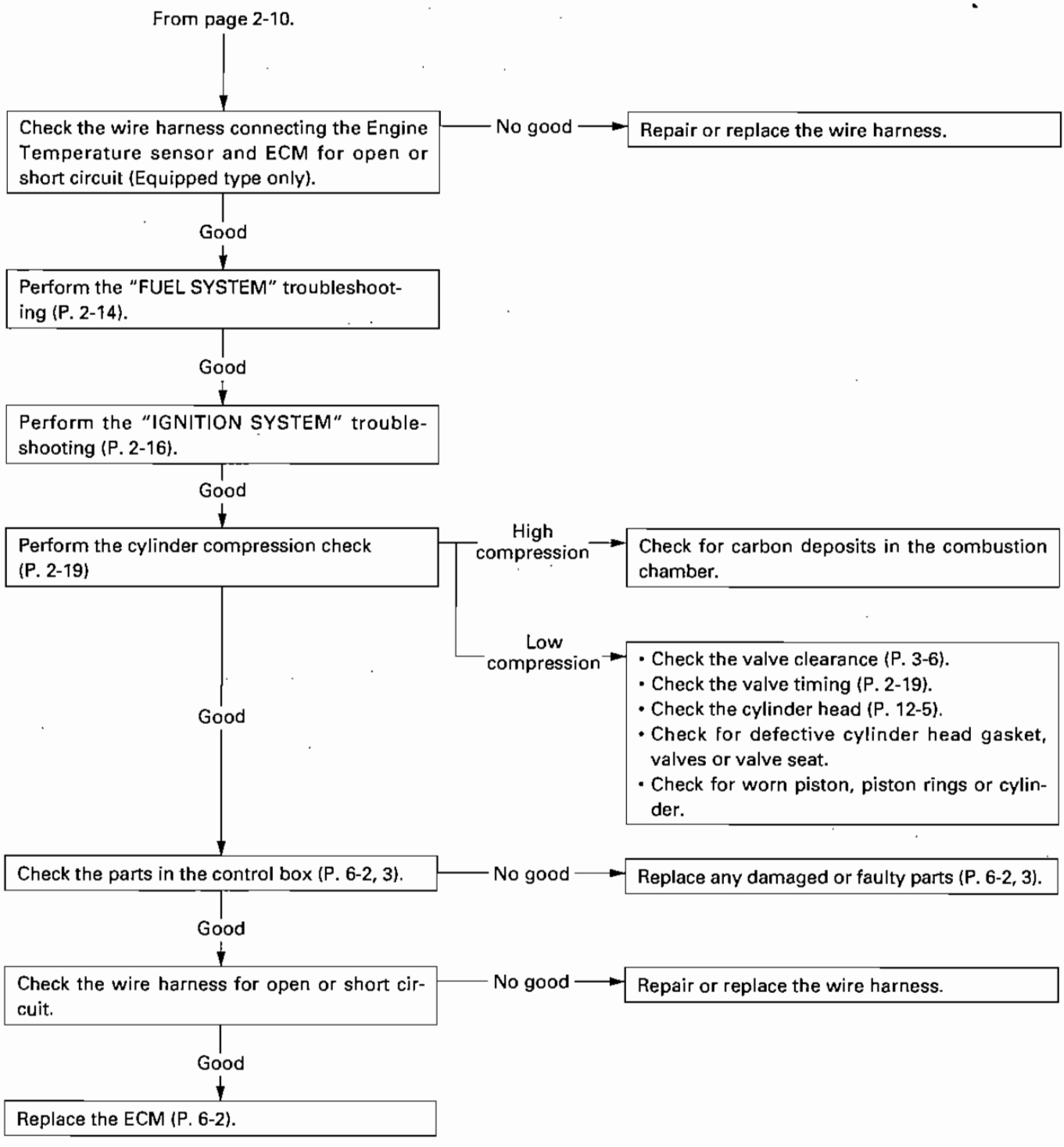

LED flashing pattern: 2 flashes per cycle.
Turn the combination switch to the OFF position and check the oil level (P. 3-2).
Insufficient
Add engine oil (P. 3-2).
Good
Check the oil level switch (P. 13-12).
No good
Replace the oil level switch (P. 13-5).
Good
Check the wire harness connecting the oil level switch and ECM for open or short circuit.
No good
Repair or replace the wire harness.
Good
Replace the ECM (P. 6-2).


LED flashing pattern: 4 flashes per cycle.
Check the Engine Temperature sensor (P. 11-10).
No good
Replace the Engine Temperature sensor (P. 11-9).
Good
Check the wire harness connecting the Engine Temperature sensor and ECM for open or short circuit.
No good
Repair or replace the wire harness.
Good
Replace the ECM (P. 6-2).

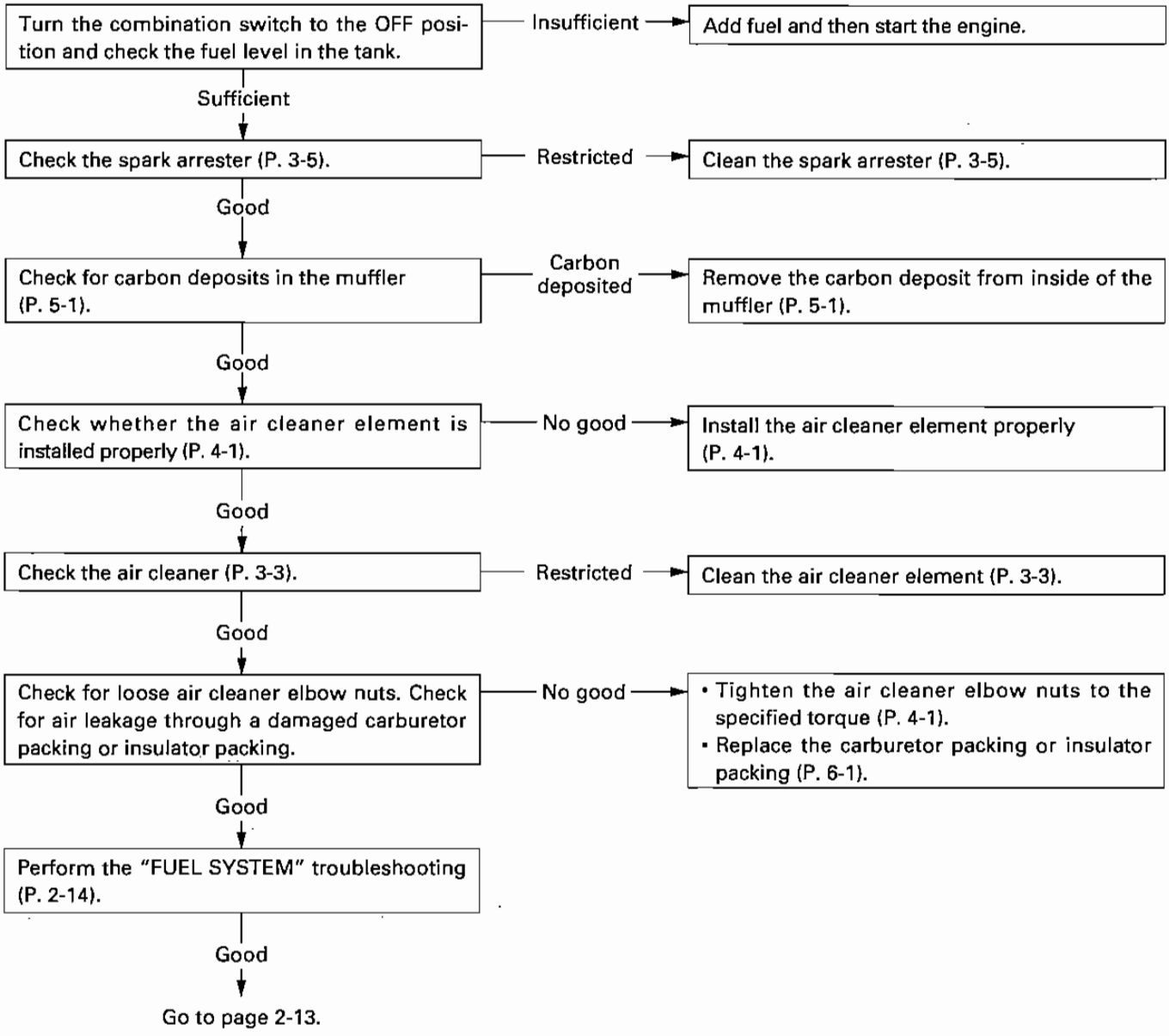

LED flashing pattern: 6 flashes per cycle.
Check the power coil (P. 2-17).
No good
Replace the power coil (P. 11-1).
Good
Replace the ECM (P. 6-2).
LED flashing pattern: 8 flashes per cycle.
Program failure (P. 2-6).

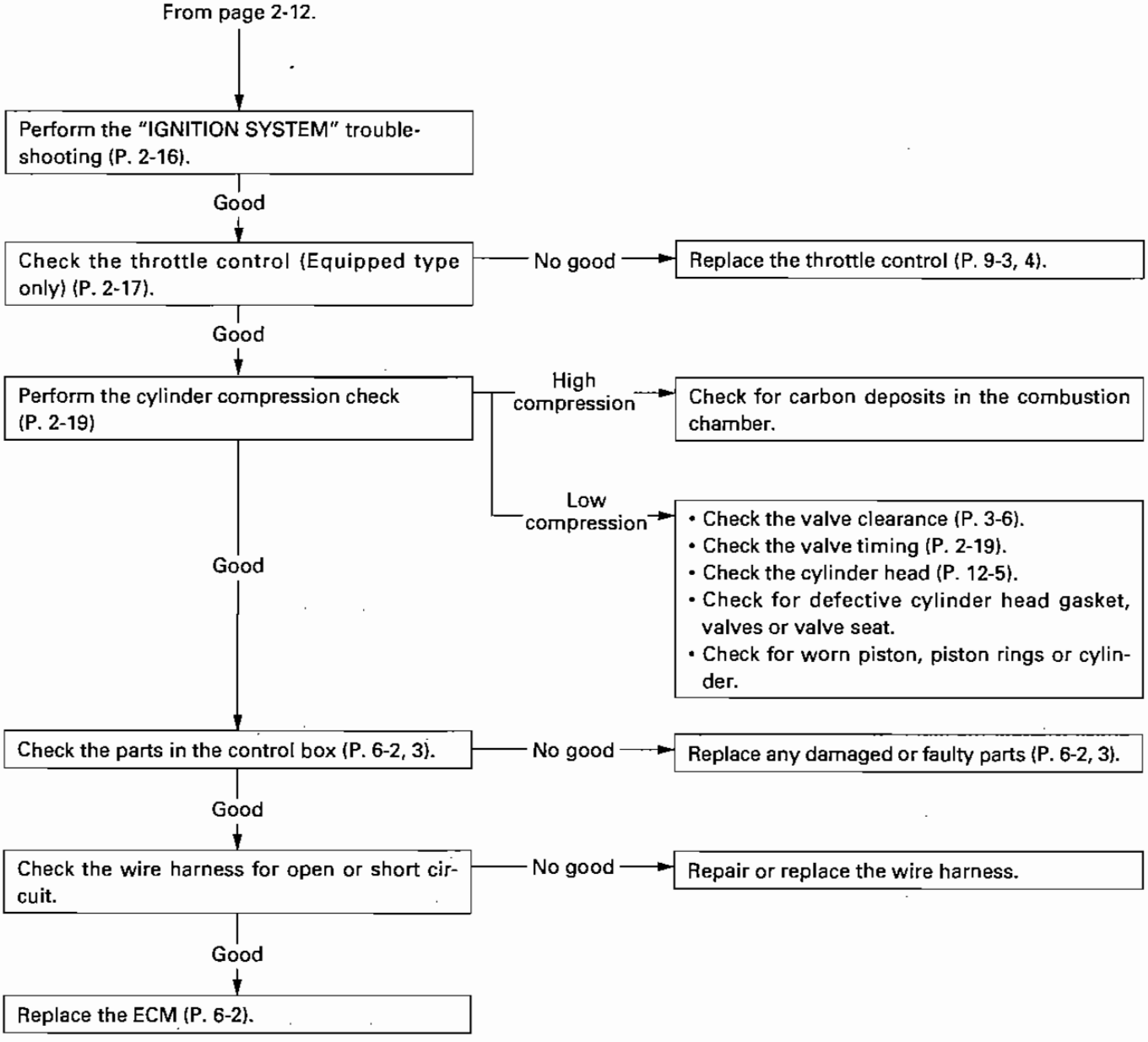
c. LED IS LIT BUT ENGINE DOES NOT START (Starter motor equipped type)/ ENGINE DOES NOT START (Starter motor not equipped type)


Turn the combination switch to the START position and check whether the engine is cranks.
No good
Check continuity between the ST and BAT terminals of the combination switch (P. 2-17). If necessary, replace the combination switch (P. 9-3).
Good
Check the starter solenoid (P. 11-6). If necessary, replace it (P. 11-5).
Good
Disassemble the starter motor and check each part (P. 11-5 through 8). If necessary, replace the faulty part (P. 11-5).
Good
Turn the combination switch to the OFF position and check the fuel level in the tank.
Insufficient
Add fuel and then start the engine.
Sufficient
Check the oil level (P. 3-2).
Insufficient
Add engine oil (P. 3-2).
Good
Check the oil level switch (P. 13-12).
No good
Replace the oil level switch (P. 13-5).
Good
Check the air cleaner (P. 3-3).
Restricted
Clean the air cleaner element (P. 3-3) and install it properly (P. 4-1).
Good
Check the spark arrester (P. 3-5).
Restricted
Clean the spark arrester (P. 3-5).
Good
Check for carbon deposits in the muffler (P. 5-1).
Carbon deposited
Remove the carbon deposit from inside of the muffler (P. 5-1).
Good
Check the Engine Temperature sensor (Equipped type only) (P. 11-10).
No good
Replace the Engine Temperature sensor (P. 11-9).
Good
Go to page 2-11.

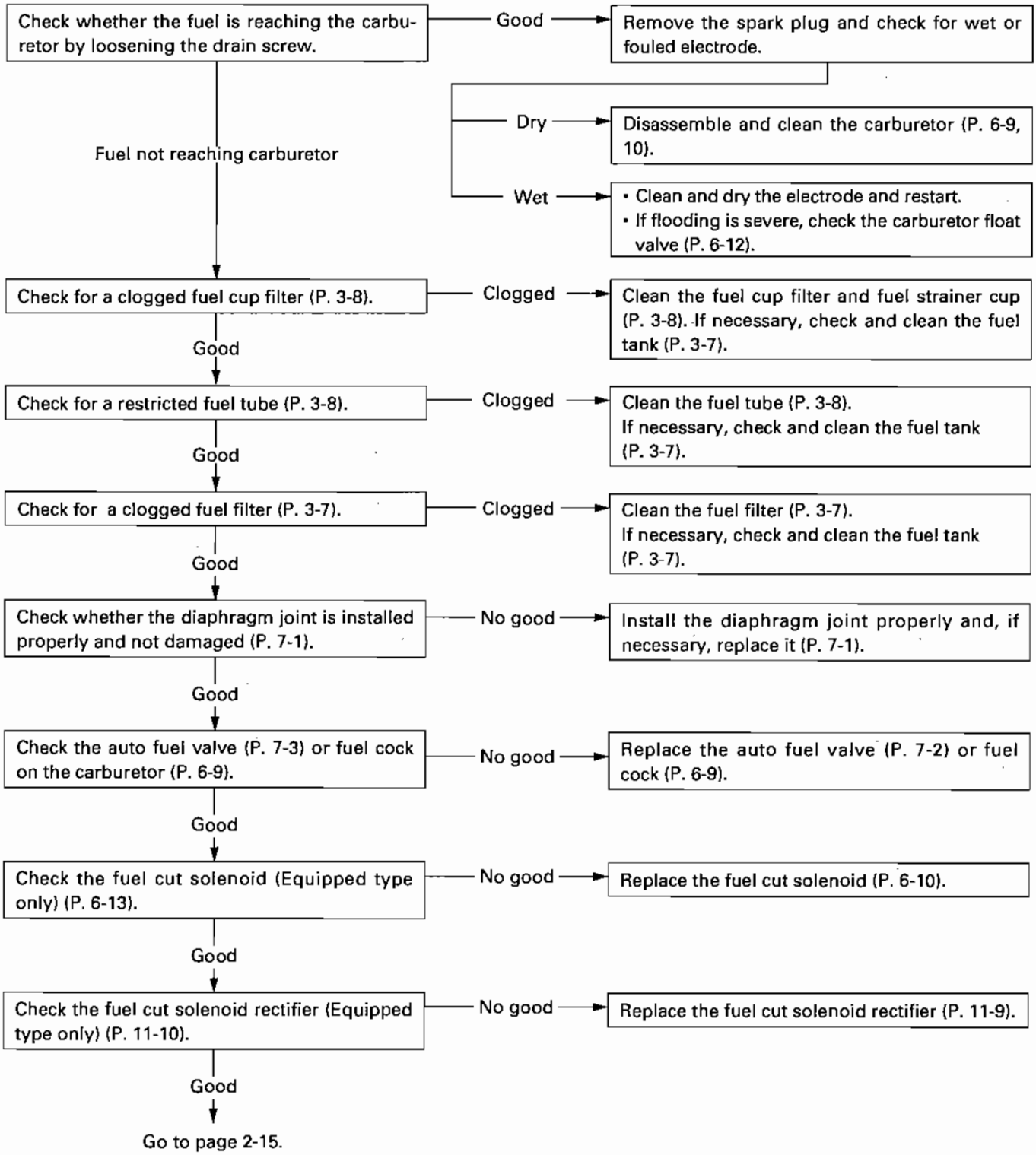

From page 2-10.
Check the wire harness connecting the Engine Temperature sensor and ECM for open or short circuit (Equipped type only).
No good
Repair or replace the wire harness.
Good
Perform the "FUEL SYSTEM" troubleshooting (P. 2-14).
Good
Perform the "IGNITION SYSTEM" troubleshooting (P. 2-16).
Good
Perform the cylinder compression check (P. 2-19)
High compression
Check for carbon deposits in the combustion chamber.
Low compression
• Check the valve clearance (P. 3-6).
• Check the valve timing (P. 2-19).
• Check the cylinder head (P. 12-5).
• Check for defective cylinder head gasket, valves or valve seat.
• Check for worn piston, piston rings or cylinder.
Good
Check the parts in the control box (P. 6-2, 3).
No good
Replace any damaged or faulty parts (P. 6-2, 3).
Good
Check the wire harness for open or short circuit.
No good
Repair or replace the wire harness.
Good
Replace the ECM (P. 6-2).

d. ENGINE SPEED DOES NOT INCREASE OR ENGINE LACKS POWER

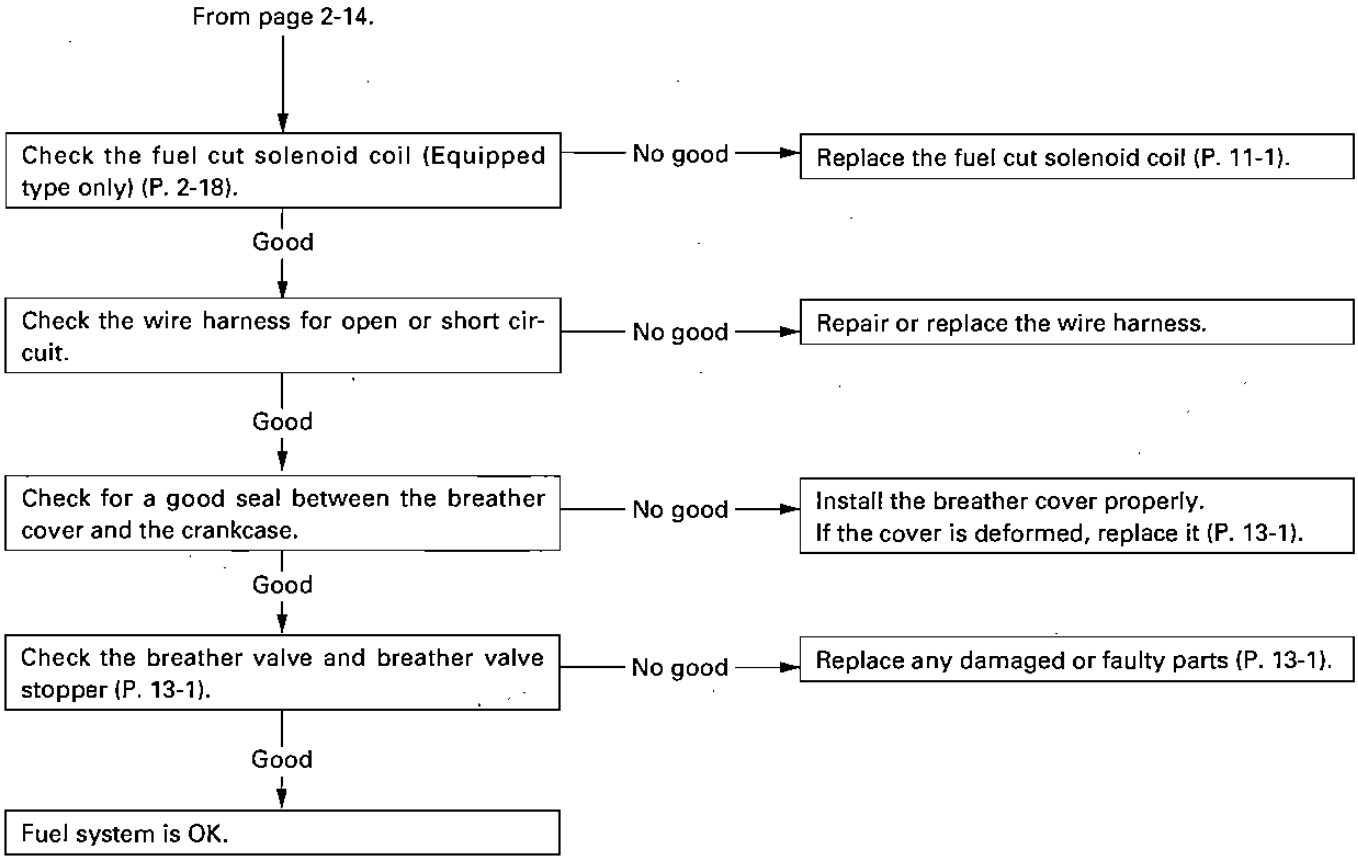

Turn the combination switch to the OFF position and check the fuel level in the tank.
Insufficient
Add fuel and then start the engine.
Sufficient
Check the spark arrester (P. 3-5).
Restricted
Clean the spark arrester (P. 3-5).
Good
Check for carbon deposits in the muffler (P. 5-1).
Carbon deposited
Remove the carbon deposit from inside of the muffler (P. 5-1).
Good
Check whether the air cleaner element is installed properly (P. 4-1).
No good
Install the air cleaner element properly (P. 4-1).
Good
Check the air cleaner (P. 3-3).
Restricted
Clean the air cleaner element (P. 3-3).
Good
Check for loose air cleaner elbow nuts. Check for air leakage through a damaged carburetor packing or insulator packing.
No good
• Tighten the air cleaner elbow nuts to the specified torque (P. 4-1).
• Replace the carburetor packing or insulator packing (P. 6-1).
Good
Perform the "FUEL SYSTEM" troubleshooting (P. 2-14).
Good
Go to page 2-13.


From page 2-12.
Perform the "IGNITION SYSTEM" trouble-shooting (P. 2-16).
Good
Check the throttle control (Equipped type only) (P. 2-17).
No good
Replace the throttle control (P. 9-3, 4).
Good
Perform the cylinder compression check (P. 2-19)
High compression
Check for carbon deposits in the combustion chamber.
Low compression
• Check the valve clearance (P. 3-6).
• Check the valve timing (P. 2-19).
• Check the cylinder head (P. 12-5).
• Check for defective cylinder head gasket, valves or valve seat.
• Check for worn piston, piston rings or cylinder.
Good
Check the parts in the control box (P. 6-2, 3).
No good
Replace any damaged or faulty parts (P. 6-2, 3).
Good
Check the wire harness for open or short circuit.
No good
Repair or replace the wire harness.
Good
Replace the ECM (P. 6-2).

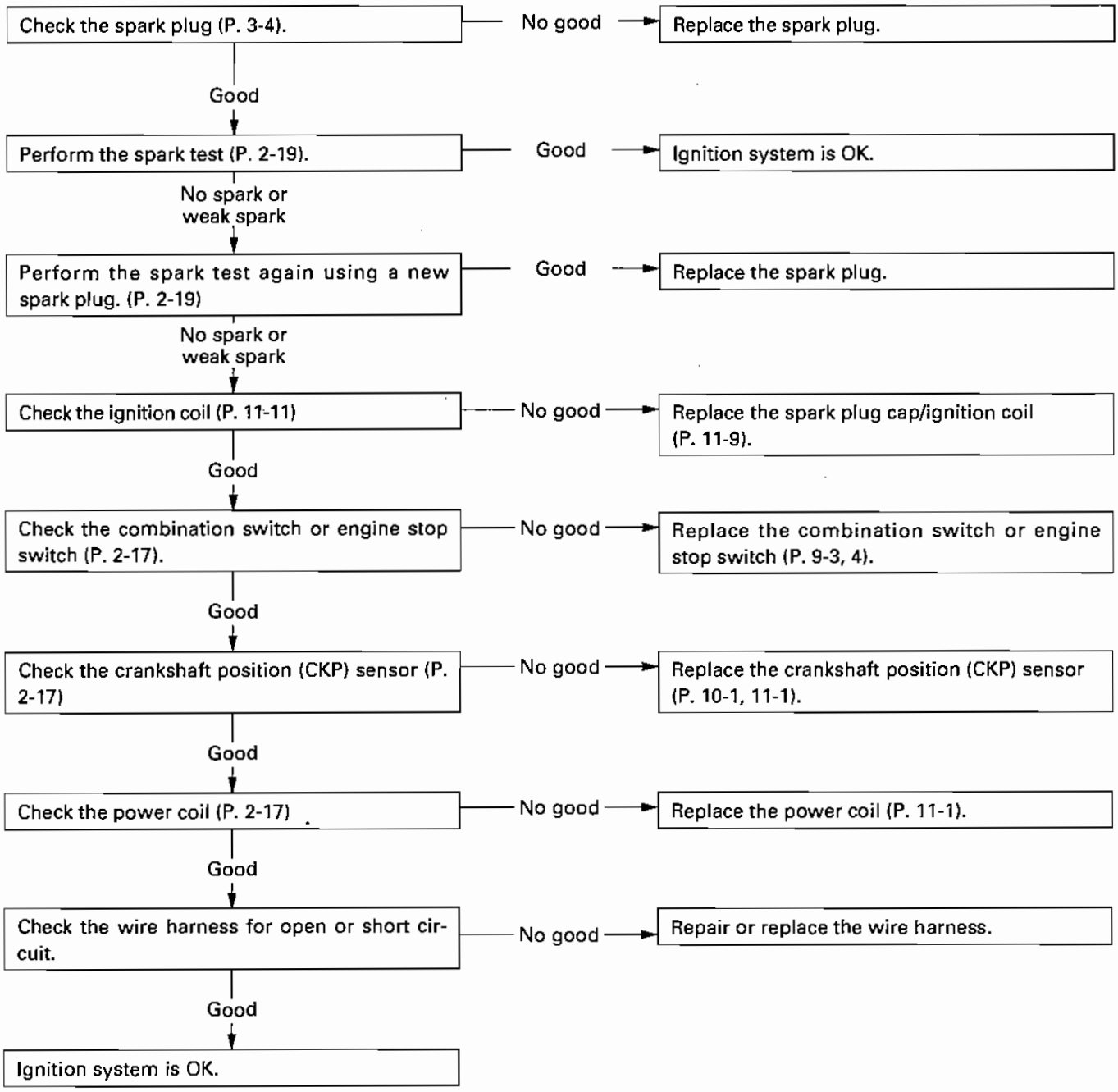
e. FUEL SYSTEM


Check whether the fuel is reaching the carburetor by loosening the drain screw.
Good
Remove the spark plug and check for wet or fouled electrode.
Dry
Disassemble and clean the carburetor (P. 6-9, 10).
Wet
• Clean and dry the electrode and restart.
• If flooding is severe, check the carburetor float valve (P. 6-12).
Fuel not reaching carburetor
Check for a clogged fuel cup filter (P. 3-8).
Clogged
Clean the fuel cup filter and fuel strainer cup (P. 3-8). If necessary, check and clean the fuel tank (P. 3-7).
Good
Check for a restricted fuel tube (P. 3-8).
Clogged
Clean the fuel tube (P. 3-8). If necessary, check and clean the fuel tank (P. 3-7).
Good
Check for a clogged fuel filter (P. 3-7).
Clogged
Clean the fuel filter (P. 3-7). If necessary, check and clean the fuel tank (P. 3-7).
Good
Check whether the diaphragm joint is installed properly and not damaged (P. 7-1).
No good
Install the diaphragm joint properly and, if necessary, replace it (P. 7-1).
Good
Check the auto fuel valve (P. 7-3) or fuel cock on the carburetor (P. 6-9).
No good
Replace the auto fuel valve (P. 7-2) or fuel cock (P. 6-9).
Good
Check the fuel cut solenoid (Equipped type only) (P. 6-13).
No good
Replace the fuel cut solenoid (P. 6-10).
Good
Check the fuel cut solenoid rectifier (Equipped type only) (P. 11-10).
No good
Replace the fuel cut solenoid rectifier (P. 11-9).
Good

Go to page 2-15.


From page 2-14.
Check the fuel cut solenoid coil (Equipped type only) (P. 2-18).
No good
Replace the fuel cut solenoid coil (P. 11-1).
Good
Check the wire harness for open or short circuit.
No good
Repair or replace the wire harness.
Good
Check for a good seal between the breather cover and the crankcase.
No good
Install the breather cover properly.
If the cover is deformed, replace it (P. 13-1).
Good
Check the breather valve and breather valve stopper (P. 13-1).
No good
Replace any damaged or faulty parts (P. 13-1).
Good
Fuel system is OK.

f. IGNITION SYSTEM

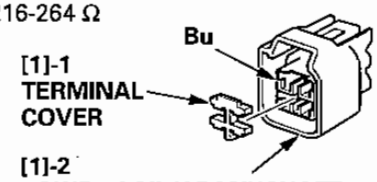

Check the spark plug (P. 3-4).
No good
Replace the spark plug.
Good
Perform the spark test (P. 2-19).
Good
Ignition system is OK.
No spark or weak spark
Perform the spark test again using a new spark plug. (P. 2-19)
Good
Replace the spark plug.
No spark or weak spark
Check the ignition coil (P. 11-11)
No good
Replace the spark plug cap/ignition coil (P. 11-9).
Good
Check the combination switch or engine stop switch (P. 2-17).
No good
Replace the combination switch or engine stop switch (P. 9-3, 4).
Good
Check the crankshaft position (CKP) sensor (P. 2-17)
No good
Replace the crankshaft position (CKP) sensor (P. 10-1, 11-1).
Good
Check the power coil (P. 2-17)
No good
Replace the power coil (P. 11-1).
Good
Check the wire harness for open or short circuit.
No good
Repair or replace the wire harness.
Good
Ignition system is OK.

• COILS AND IGNITION SWITCHES CHECK

[1] CRANKSHAFT POSITION (CKP) SENSOR INSPECTION

Measure the resistance between the terminal and engine ground (fan cover bolt).

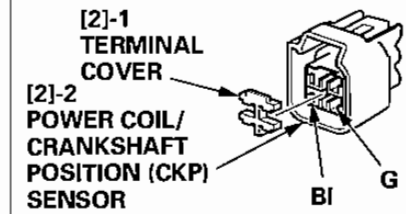
Bu-Ground
Specified resistance:
216-264 Ω



[2] POWER COIL INSPECTION

Measure the resistance between the terminals.

Bl-G
Specified resistance:
3.4-5.3 Ω

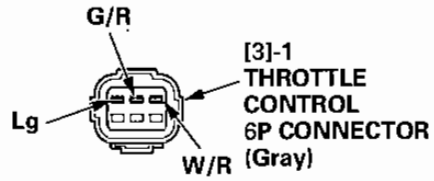


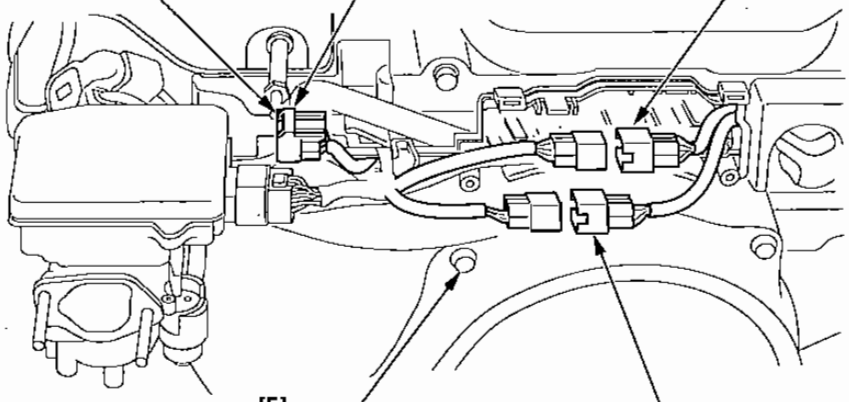
[3] THROTTLE CONTROL INSPECTION

Measure the resistance between the terminals when rotating the throttle control knob fully in the clockwise direction and when rotating it fully in the counterclockwise direction.

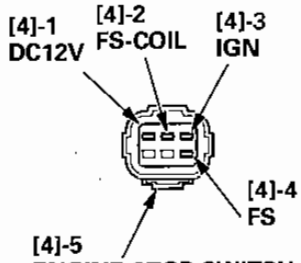
Lg-G/R
Specified resistance:
3-7 kΩ (Clockwise direction)
0-500 Ω (Counterclockwise direction)

Lg-W/R
3-7 kΩ (Clockwise direction)
3-7 kΩ (Counterclockwise direction)



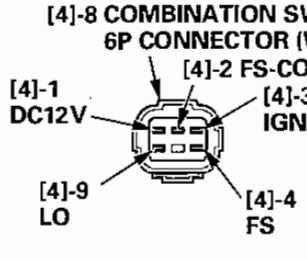


[4] COMBINATION SWITCH/ENGINE STOP SWITCH CHECK



[4]-6 ENGINE STOP SWITCH CONTINUITY TABLE (With fuel cut solenoid type)

Switch position	DC12V Bl/R	IGN Br	FS-COIL O	FS R/W
OFF			○—○	
ON	○—○			



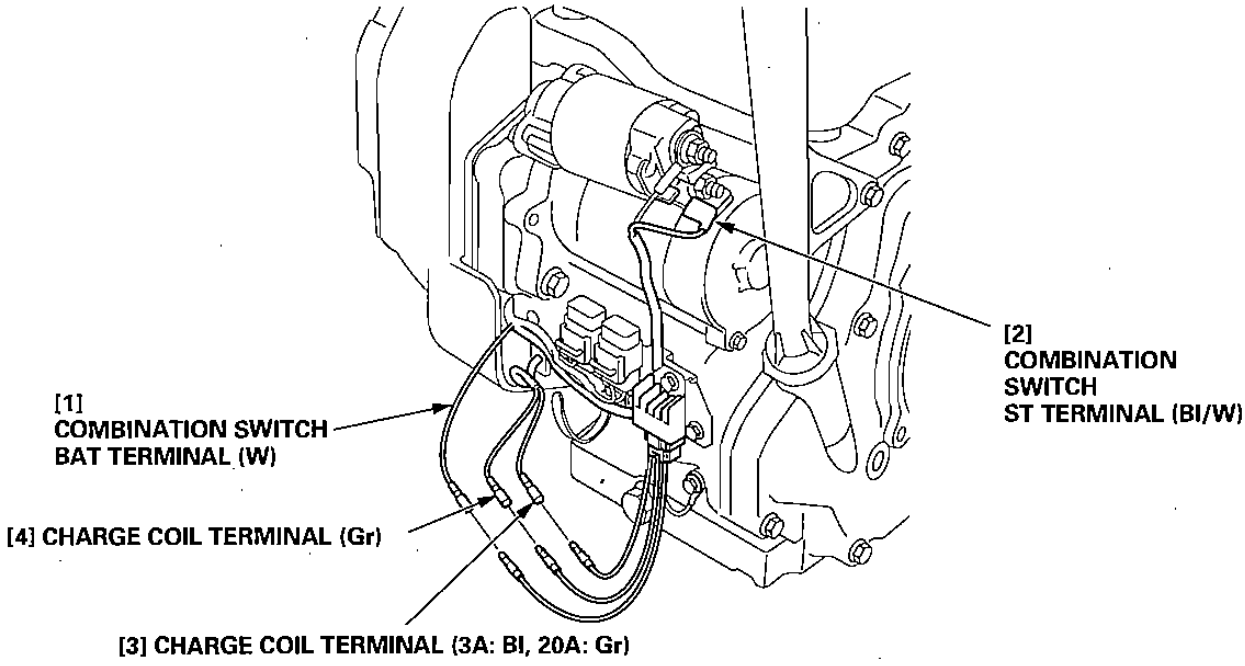
[4]-7 ENGINE STOP SWITCH CONTINUITY TABLE (Without fuel cut solenoid type)

Switch position	DC12V Bl/R	IGN Br
OFF		
ON	○—○	

[4]-10 COMBINATION SWITCH CONTINUITY TABLE

Switch position	DC12V Bl/R	IGN Br	FS-COIL O	FS R/W	LO Bl/Y	BAT W	ST Bl/W
OFF			○—○				
ON	○—○				○—○		
START	○—○				○—○	○—○	

BAT and ST terminal location: P. 2-18



[5]
CHARGE COIL INSPECTION

Measure the resistance between the terminals.

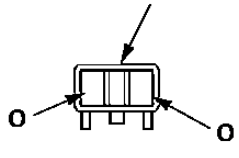
3A: Bl-Gr, 20A: Gr-Gr
Specified resistance:
1.8-2.8 Ω (3A)
0.1-0.3 Ω (20A)

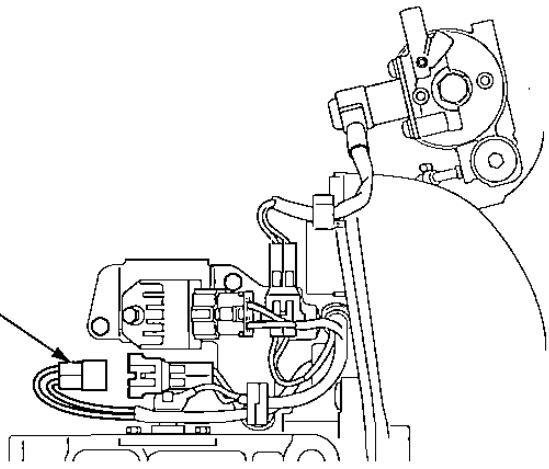
[6]
FUEL CUT SOLENOID COIL INSPECTION

Measure the resistance between the terminals.

O-O
Specified resistance:
3.1-4.7 Ω

[6]-1
FUEL CUT SOLENOID COIL
2P CONNECTOR (White)





• SPARK TEST

⚠ WARNING

Gasoline is highly flammable and explosive.

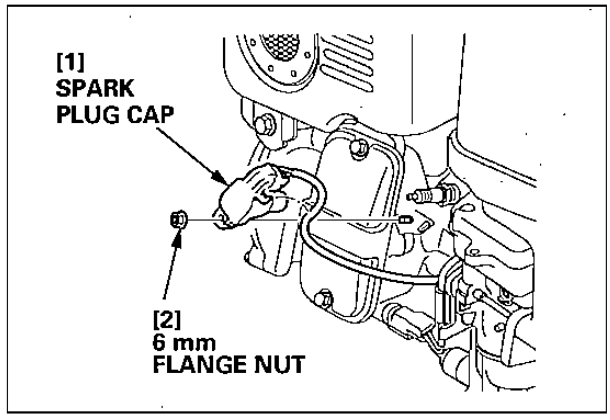
You can be burned or seriously injured when handling fuel.

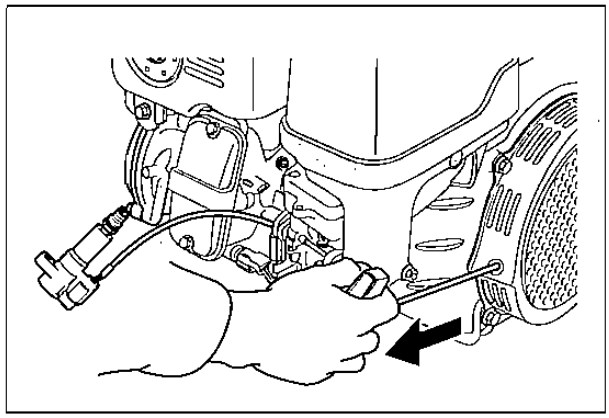
- Keep heat, sparks and flame away.
- Handle fuel only outdoors.
- Wipe up spills immediately.

NOTICE

Do not operate the starter motor for more than 5 seconds at one try. If stable compression is not obtained within 5 seconds, stop the starter motor and wait 10-20 seconds to allow the starter motor to cool, and repeat the operation again.

1) Loosen the carburetor drain screw to drain the carburetor througly.
2) Remove the spark plug cap from the spark plug.
3) Remove the spark plug from the cylinder (P. 3-4).
4) Crank the engine several times to expel unburnt gas.
5) Attach the spark plug cap to the spark plug.
6) Ground negative (–) electrode (i.e. threaded part) of the spark plug against the cylinder side head cover bolt.
   With recoil starter type:
   Pull the recoil starter to check whether sparks jump across the electrodes.
   With starter motor type:
   Turn the combination switch to the "START" position to check whether sparks jump across the electrodes.





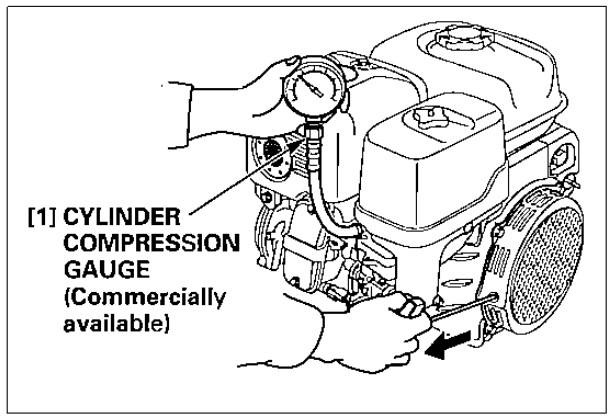
• CYLINDER COMPRESSION CHECK

1) Remove the spark plug cap and spark plug.
2) Turn the throttle control to the HIGH position.
3) **With recoil starter type:**
   Pull the recoil starter forcefully several times, and measure the cylinder compression.

Cylinder compression	0.39-0.68 MPa (4-7 kgf/cm², 57-100 psi) at 600 min⁻¹ (rpm)

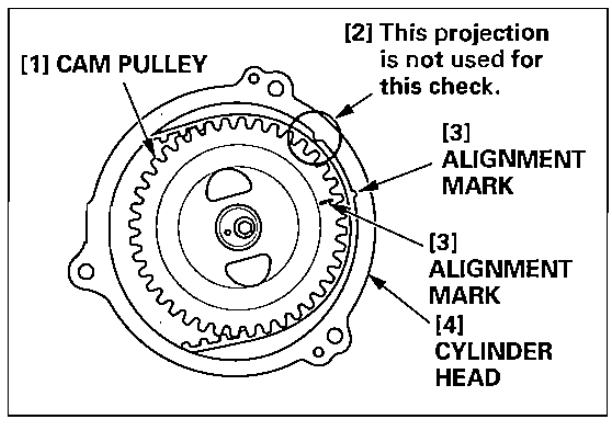
   Without recoil starter type:
   Turn the combination switch to the "START" position until stable compression is obtained.

Cylinder compression	0.39-0.68 MPa (4-7 kgf/cm², 57-100 psi) at 600 min⁻¹ (rpm)



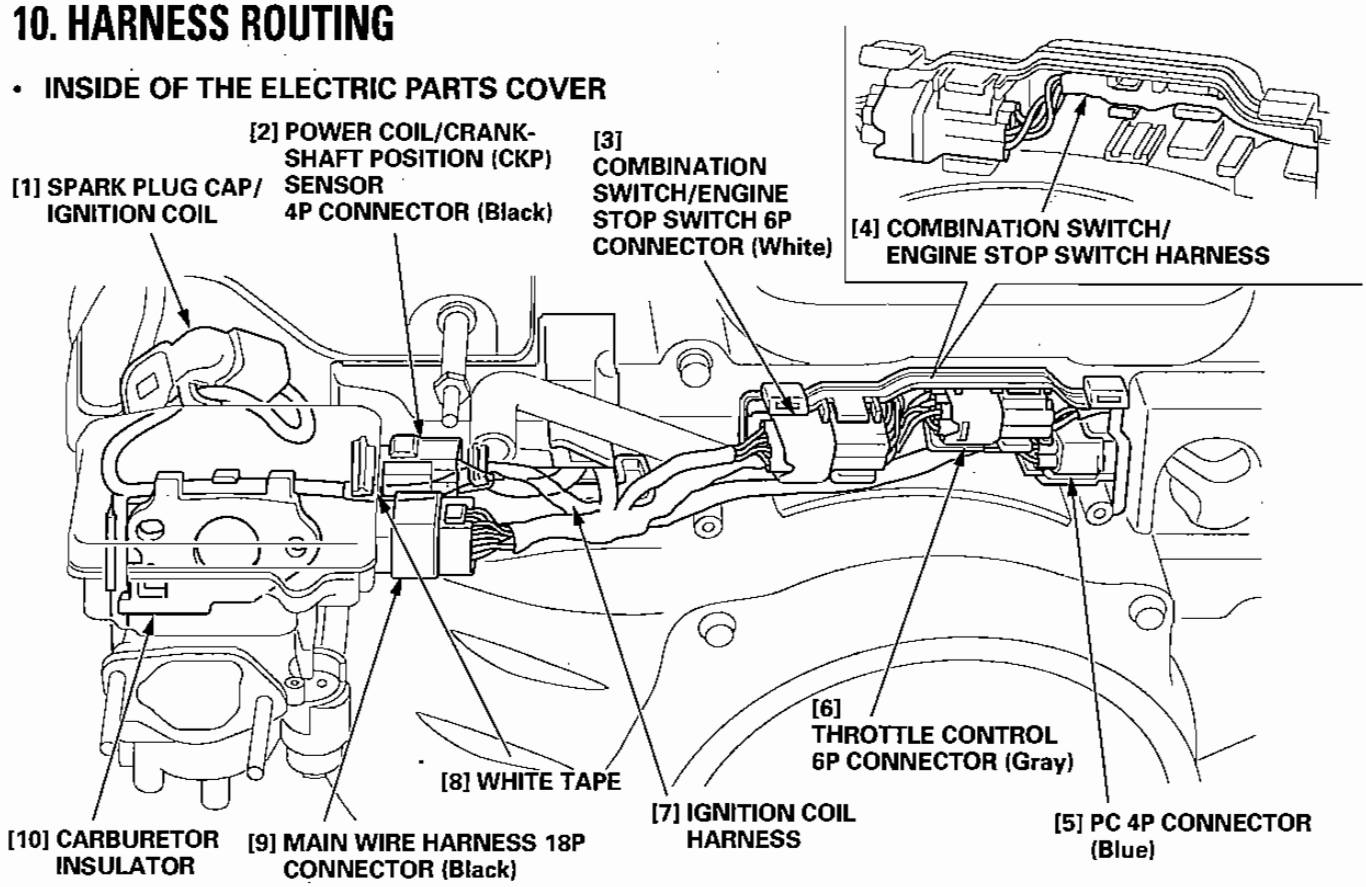
• VALVE TIMING CHECK

1) Set the piston at top dead center of the compression stroke (P. 3-6).
2) Remove the cylinder head side cover (P. 12-1).
3) Check whether the alignment mark of the cylinder head and alignment mark of the cam pulley are aligned.
   If not, proceed as follows:
   a. Remove the timing belt from the cam pulley.
   b. Turn the cam pulley to align the alignment mark of the cam pulley with the alignment mark of the cylinder head.
   c. Set the timing belt to the cam pulley while holding the cam pulley.

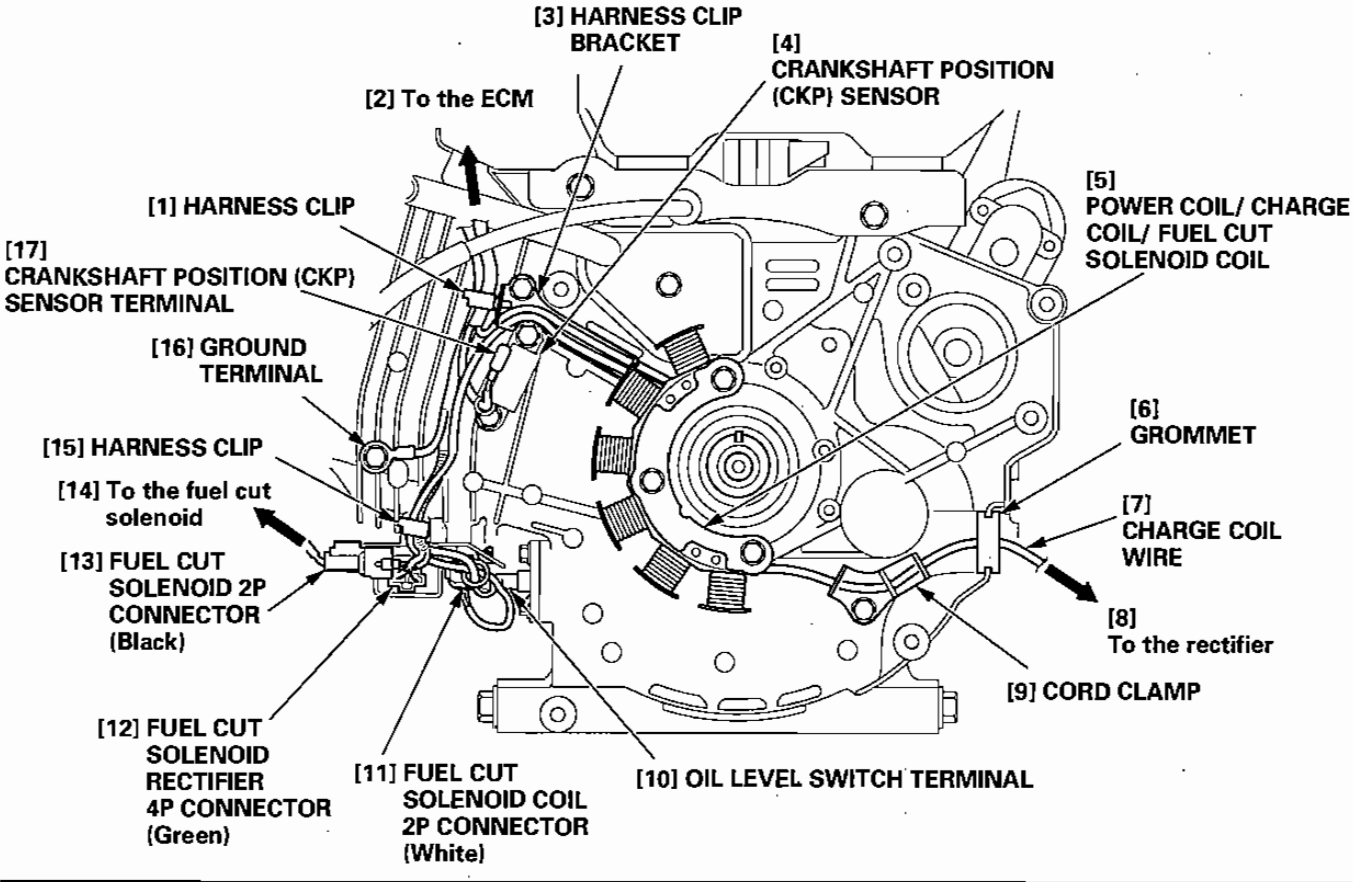


10. HARNESS ROUTING

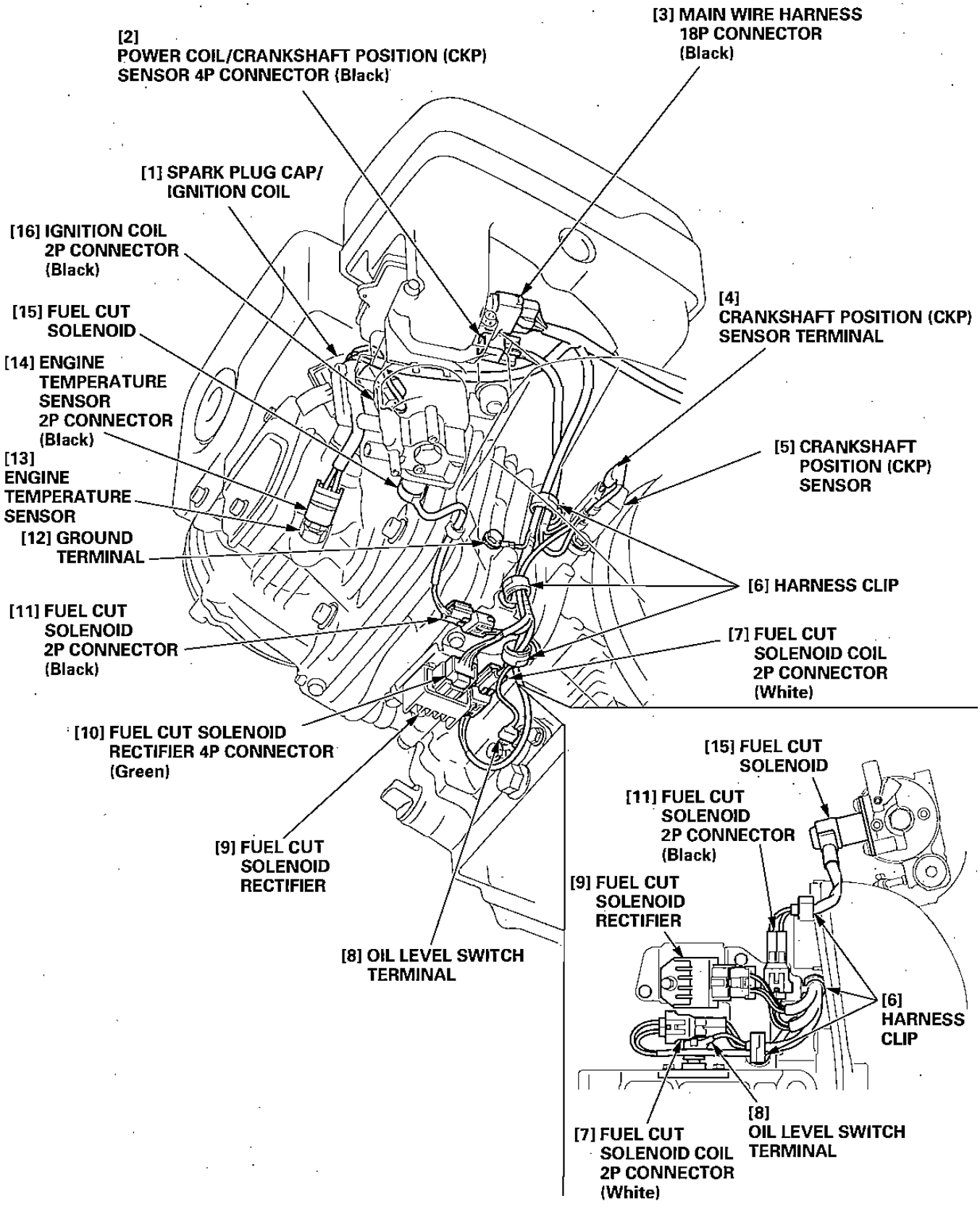
- INSIDE OF THE ELECTRIC PARTS COVER


[1] SPARK PLUG CAP/ IGNITION COIL
[2] POWER COIL/CRANK-SHAFT POSITION (CKP) SENSOR 4P CONNECTOR (Black)
[3] COMBINATION SWITCH/ENGINE STOP SWITCH 6P CONNECTOR (White)
[4] COMBINATION SWITCH/ ENGINE STOP SWITCH HARNESS
[5] PC 4P CONNECTOR (Blue)
[6] THROTTLE CONTROL 6P CONNECTOR (Gray)
[7] IGNITION COIL HARNESS
[8] WHITE TAPE
[9] MAIN WIRE HARNESS 18P CONNECTOR (Black)
[10] CARBURETOR INSULATOR

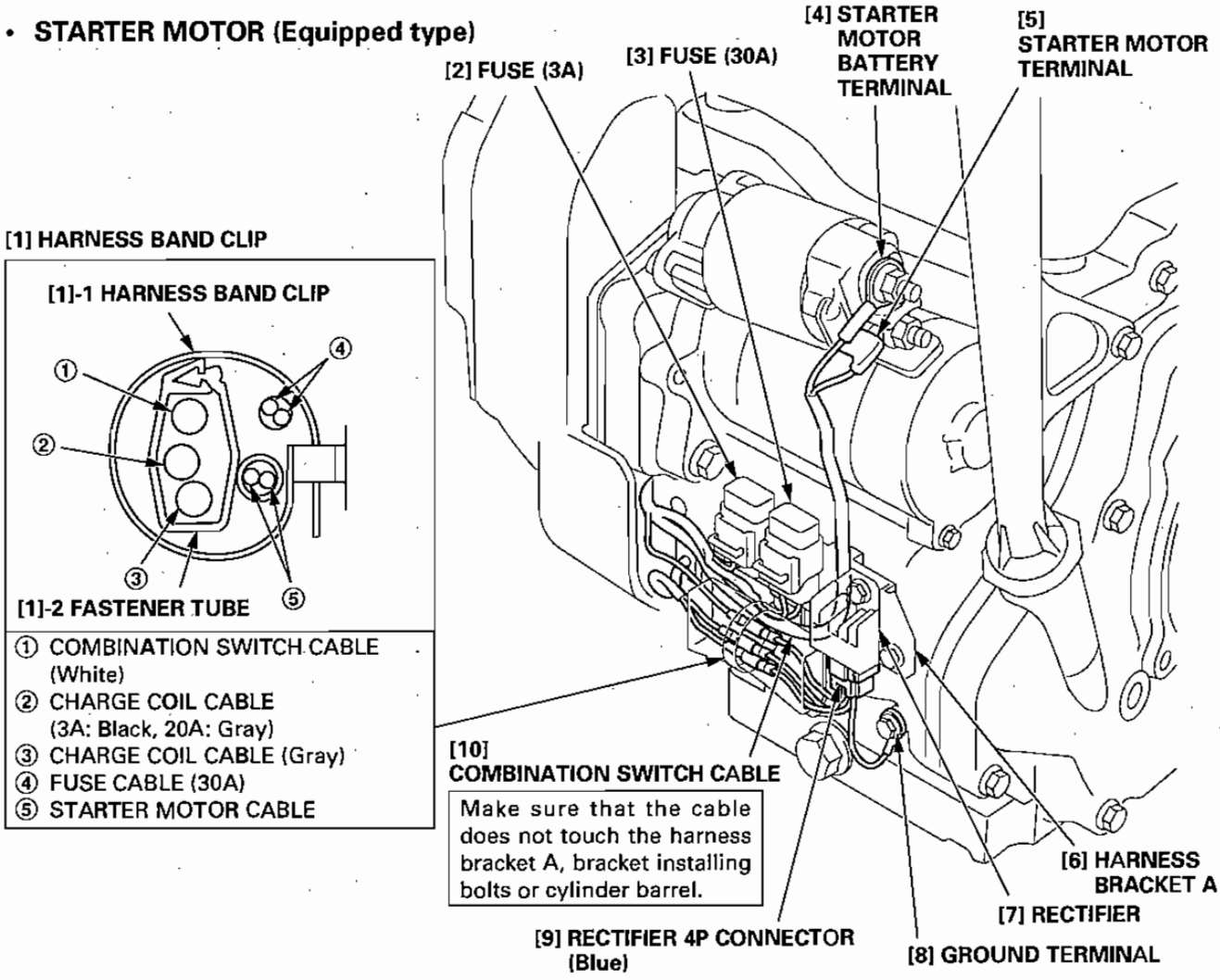
- INSIDE OF THE FAN COVER


[1] HARNESS CLIP
[2] To the ECM
[3] HARNESS CLIP BRACKET
[4] CRANKSHAFT POSITION (CKP) SENSOR
[5] POWER COIL/ CHARGE COIL/ FUEL CUT SOLENOID COIL
[6] GROMMET
[7] CHARGE COIL WIRE
[8] To the rectifier
[9] CORD CLAMP
[10] OIL LEVEL SWITCH TERMINAL
[11] FUEL CUT SOLENOID COIL 2P CONNECTOR (White)
[12] FUEL CUT SOLENOID RECTIFIER 4P CONNECTOR (Green)
[13] FUEL CUT SOLENOID 2P CONNECTOR (Black)
[14] To the fuel cut solenoid
[15] HARNESS CLIP
[16] GROUND TERMINAL
[17] CRANKSHAFT POSITION (CKP) SENSOR TERMINAL

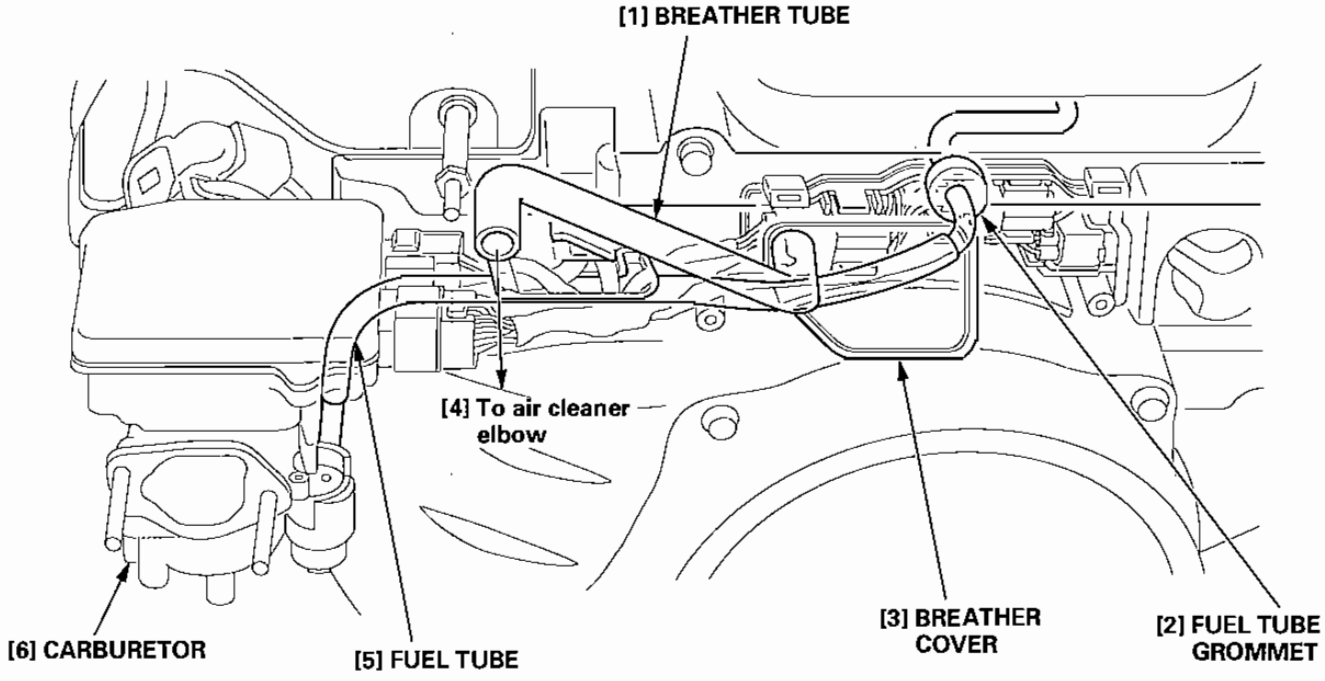
• LOWER PART OF THE CYLINDER



- **STARTER MOTOR (Equipped type)**


[1] HARNESS BAND CLIP
[1]-1 HARNESS BAND CLIP
[1]-2 FASTENER TUBE
① COMBINATION SWITCH CABLE (White)
② CHARGE COIL CABLE (3A: Black, 20A: Gray)
③ CHARGE COIL CABLE (Gray)
④ FUSE CABLE (30A)
⑤ STARTER MOTOR CABLE
[2] FUSE (3A)
[3] FUSE (30A)
[4] STARTER MOTOR BATTERY TERMINAL
[5] STARTER MOTOR TERMINAL
[10] COMBINATION SWITCH CABLE
Make sure that the cable does not touch the harness bracket A, bracket installing bolts or cylinder barrel.
[6] HARNESS BRACKET A
[7] RECTIFIER
[8] GROUND TERMINAL
[9] RECTIFIER 4P CONNECTOR (Blue)

11. TUBE ROUTING



3. MAINTENANCE

1. MAINTENANCE SCHEDULE
2. ENGINE OIL
3. AIR CLEANER
4. SPARK PLUG
5. SPARK ARRESTER
6. VALVE CLEARANCE
7. FUEL TANK
8. FUEL TUBE
9. FUEL STRAINER CUP

1. MAINTENANCE SCHEDULE

	REGULAR SERVICE PERIOD (1) / ITEM Perform at every indicated month or operating hour interval, whichever comes first.		Each use	First month or 20 Hrs.	Every 6 months or 100 Hrs.	Every year or 300 Hrs.	Every 2 years or 500 Hrs.	Refer to page
•	Engine oil	Check level	○					3-2
		Change		○	○			
•	Air cleaner	Check	○					3-3
		Clean			○ (2)			
		Replace					○	
•	Spark plug	Check-adjust			○			3-4
		Replace				○		
	Spark arrester	Check-clean			○			3-5
•	Valve clearance	Check-adjust				○		3-6
•	Fuel strainer cup	Clean			○			3-8
	Timing belt	Check	After every 500 Hrs (Replace if necessary) (3)					—
•	Combustion chamber	Clean	After every 500 Hrs					12-2
•	Fuel tank and filter	Clean			○			3-7
•	Fuel tube	Check	Every 2 years (Replace if necessary)					3-8

• Emission related items.
(1) For commercial use, log hours of operation to determine proper maintenance intervals.
(2) Service more frequently when used in dusty areas.
(3) Check the belt for cracks or abnormal wear; replace if necessary.

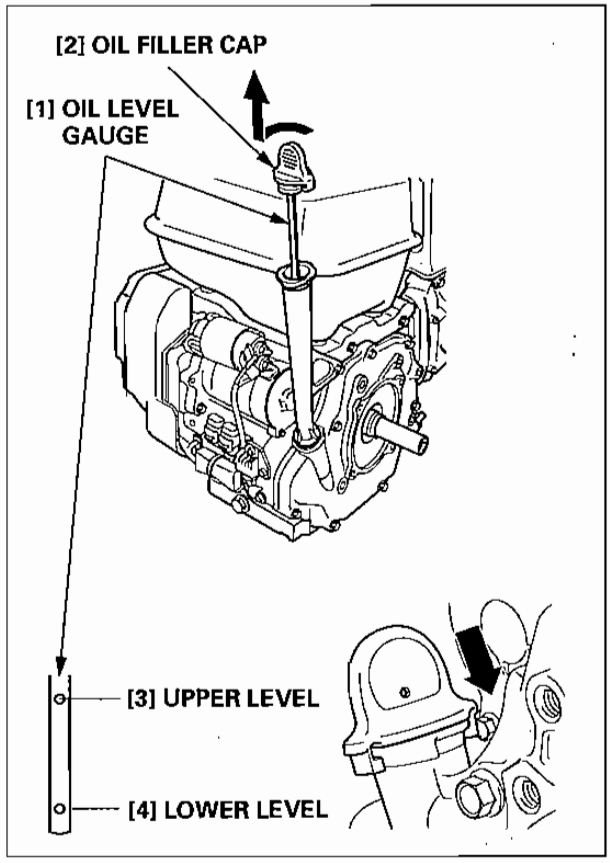
2. ENGINE OIL

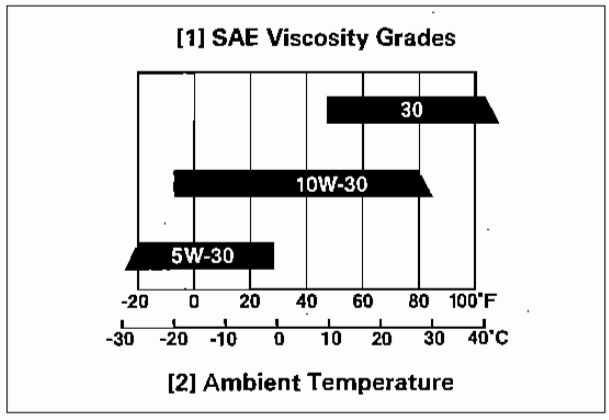
Oil level check:

1) Place the engine on a level surface.
2) Turn the oil filler cap counterclockwise 90 degrees to unlock the cap and remove the oil level gauge from the oil filler neck. Wipe the oil level gauge clean.
3) Insert the oil level gauge without screwing it into the oil filler neck. Remove the oil filler cap and check the oil level shown on the oil level gauge.
4) If the oil level is near or below the lower level mark on the oil level gauge, fill with the recommended oil to the upper level mark.

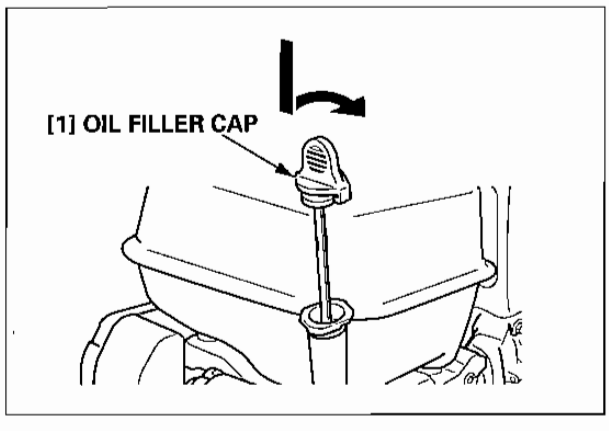
Recommended oil	SAE 10W-30 API Service classification SE, SF or SG

Oil is a major factor affecting performance and service life. Use 4-stroke automotive detergent oil.
SAE 10W-30 is recommended for general use. Other viscosities shown in the chart may be used when the average temperature in your area is within the recommended range.





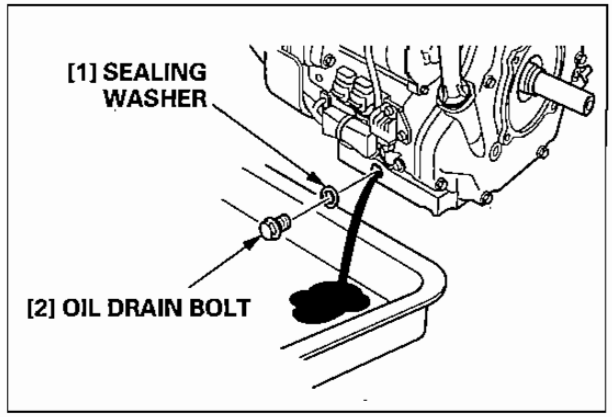
5) Insert the oil level gauge into the oil filler neck and turn the oil filler cap clockwise 90 degrees to lock the cap.



Oil change:

1) Check the engine on a level surface and remove the oil filler cap (P. 3-2)
2) Remove the oil drain bolt and sealing washer, and drain the oil into a suitable container.

   Please dispose of used motor oil in a manner that is compatible with the environment. We suggest you take used oil in a sealed container to your local recycling center or service station for reclamation. Do not throw it in the trash, pour it into the ground, or down a drain.



⚠ CAUTION

Used engine oil contains substances that have been identified as carcinogenic.

If repeatedly left in contact with the skin for prolonged periods, it may cause skin cancer.

Wash your hands thoroughly with soap and water as soon as possible after contact with used engine oil.

3) Tighten the oil drain bolt and a new sealing washer to the specified torque.

   TORQUE: 45 N·m (4.5 kgf·m, 33 lbf·ft)

4) Refill with the recommended oil (P. 3-2).

Engine oil capacity	1.10 ℓ (1.16 US qt, 0.97 Imp qt)

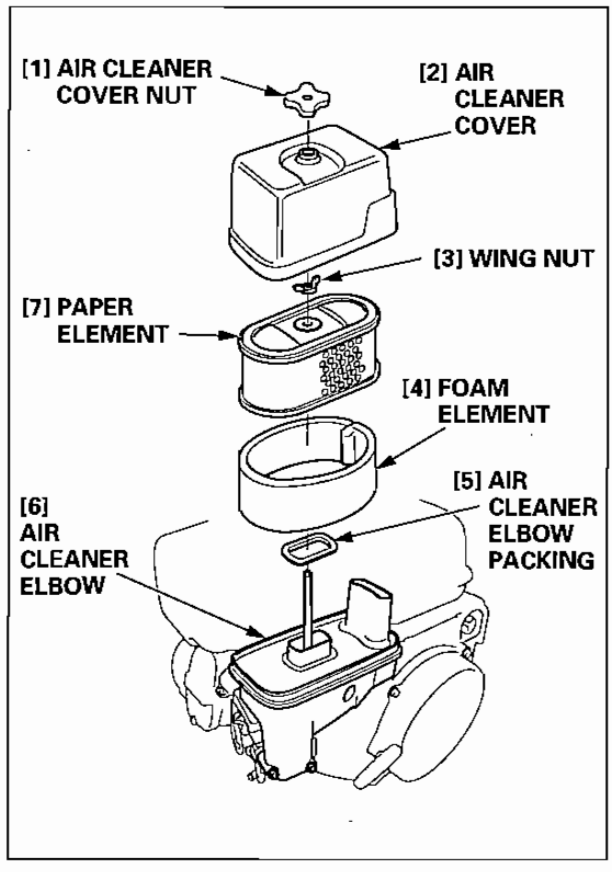
5) Check the oil level and, if the oil level is near or below the lower limit mark on the oil level gauge, fill with the recommended oil to the upper level mark (P. 3-2).
6) Install the oil filler cap (P. 3-2).

3. AIR CLEANER

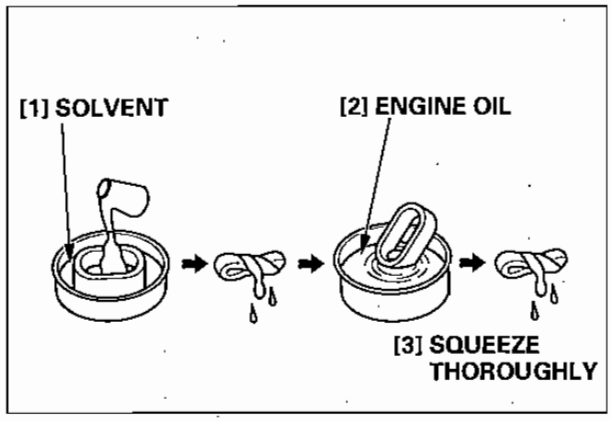
Cleaning:

A dirty air cleaner will restrict air flow to the carburetor, reducing engine performance. If the engine is operated in dusty areas, clean the air cleaner more often than specified in the MAINTENANCE SCHEDULE.

1) Remove the air cleaner cover nut and air cleaner cover.
2) Remove the wing nut, air cleaner elements (paper element and foam element) and air cleaner elbow packing, and separate them. Carefully check both elements for holes or tears and replace if damaged. Check the air cleaner elbow packing for deterioration or damage.

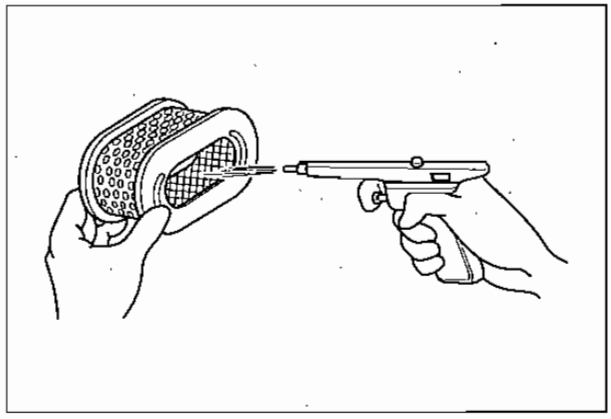


3) Foam element:
Clean the element in warm soapy water, rinse and allow to dry thoroughly, or clean with a high flash point solvent and allow to dry thoroughly. Dip the element in clean engine oil and squeeze out all the excess oil.
Excess oil will restrict air flow through the form element and may cause the engine to smoke at startup.



4) Paper element:
Tap the element lightly several times on a hard surface to remove excess dirt or blow compressed air lightly (207 kPa (2.1 kgf/cm², 30 psi) or less) through the filter from the inside out. Never try to brush the dirt off; brushing will force dirt into the fibers.
5) Wipe dirt from the inside of the air cleaner elbow and air cleaner cover, using a rag. Be careful to prevent dirt from entering the air duct that leads to the carburetor.
6) Install the foam element to the paper element.
Install the air cleaner elbow packing and air cleaner elements, and tighten the wing nut securely.

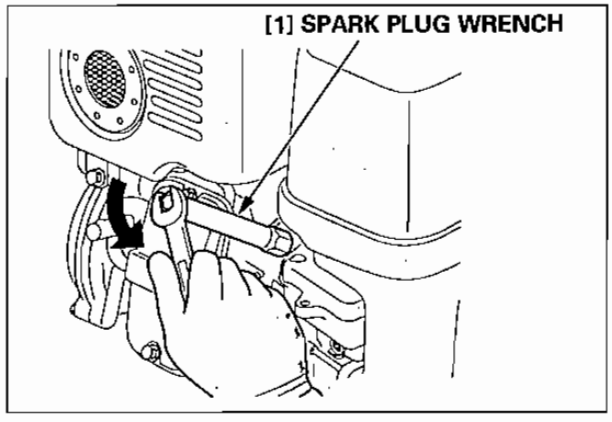
Install the air cleaner cover and tighten the air cleaner cover nut securely.



NOTICE

Operating the engine without the air cleaner element or with the element installed loosely will allow dirt to enter the engine, causing rapid engine wear. Install the air cleaner element securely.

4. SPARK PLUG



Inspection/cleaning:
If the engine has been running, the engine will be very hot. Allow it to cool before proceeding.

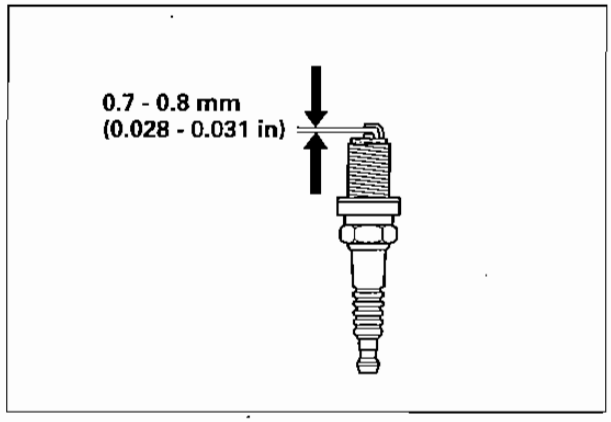
1) Remove the spark plug cap (P. 2-19) and remove the spark plug using a spark plug wrench.

2) Visually inspect the spark plug. Discard the plug if the insulator is cracked or chipped.
3) Remove carbon and other deposits with a plug cleaner or stiff wire brush. Check the sealing washer for damage.

Spark plug	BKR7E-E (NGK) K22PR-UR (DENSO)

4) Measure the plug gap with a wire-type feeler gauge. If the measurement is outside the specification, adjust by bending the side electrode.

Plug gap	0.7 - 0.8 mm (0.028 - 0.031 in)



5) Install the spark plug fingertight to seat the washer, and then tighten with a plug wrench.
If reinstalling the used spark plug, tighten 1/8-1/4 turn after the spark plug seats.
If installing a new spark plug, tighten 1/2 turn after the spark plug seats.

TORQUE: 18 N·m (1.8 kgf·m, 13 lbf·ft)

NOTICE
A loose spark plug can become very hot and can damage the engine. Overtightening can damage the threads in the cylinder block.

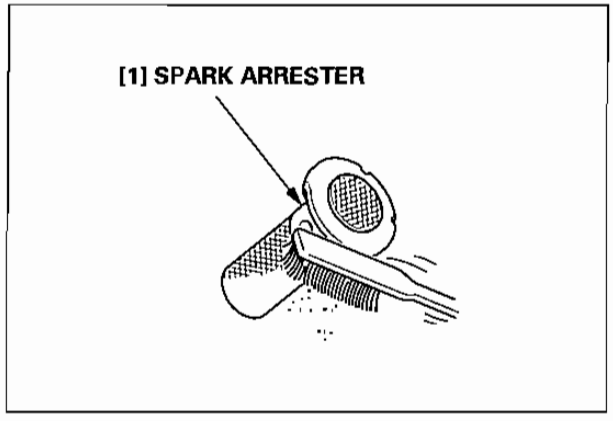
6) Install the spark plug cap securely (P. 2-19).

5. SPARK ARRESTER

Cleaning:

⚠ CAUTION
The engine and muffler become very hot during operation and they remain hot for a while after operation. Be sure that the engine is cool before muffler removal/installation.

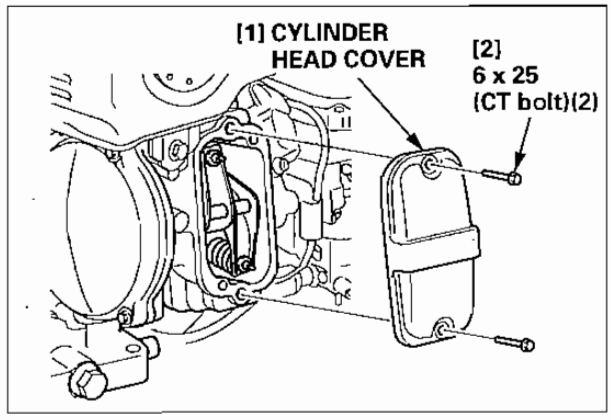
1) Remove the spark arrester from the muffler (P. 5-1).
2) Clean the carbon deposits from the spark arrester screen with a brush.
3) Check the spark arrester screen for damage. If the spark arrester is damaged, replace it.
4) Reinstall the spark arrester to the muffler (P. 5-1).



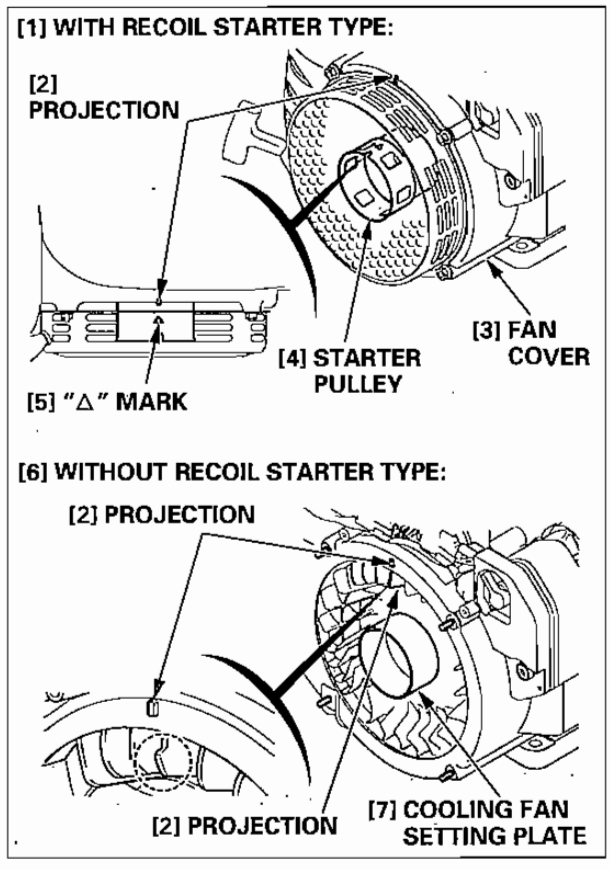
6. VALVE CLEARANCE

Inspection/adjustment:
Valve clearance inspection and adjustment must be performed with the engine cold.

1) Remove the cylinder head cover.

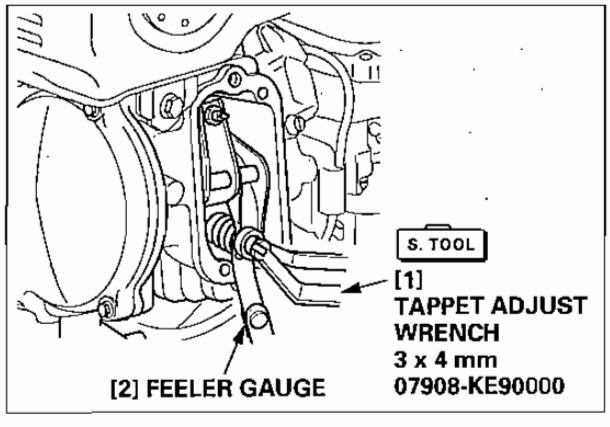


2) with **recoil starter type:**
Set the piston at top dead center of the compression stroke (both valves fully closed) by pulling the recoil starter slowly. The "Δ" mark on the starter pulley will align with the projection on the fan cover when the piston is at top dead center of the compression stroke.
without recoil starter type:
Set the piston at top dead center of the compression stroke (both valves fully closed) by turning the cooling fan setting plate. The projection of the cooling fan will align with the projection on the fan cover when the piston is at top dead center of the compression stroke.



3) Insert a feeler gauge between the rocker arm and valve to measure valve clearance.

Valve clearance	IN	0.12 ± 0.02 mm
	EX	0.15 ± 0.02 mm

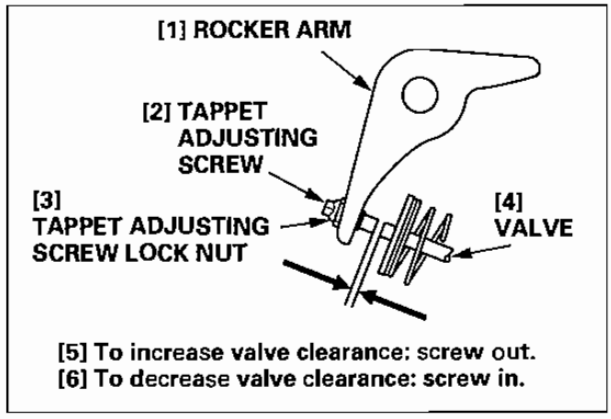


4) If adjustment is necessary, proceed as follows:
   a. Hold the tappet adjusting screw using the special tool and loosen the tappet adjusting screw lock nut.
   b. Turn the tappet adjusting screw to obtain the specified clearance.
   c. Retighten the tappet adjusting screw lock nut while holding the rocker arm pivot.

   TORQUE: 7.5 N·m (0.75 kgf·m, 5.5 lbf·ft)

   Recheck valve clearance after tightening the tappet adjusting screw lock nut.

5) Install the cylinder head cover.


[1] ROCKER ARM
[2] TAPPET ADJUSTING SCREW
[3] TAPPET ADJUSTING SCREW LOCK NUT
[4] VALVE
[5] To increase valve clearance: screw out.
[6] To decrease valve clearance: screw in.

7. FUEL TANK

Cleaning:

⚠ WARNING

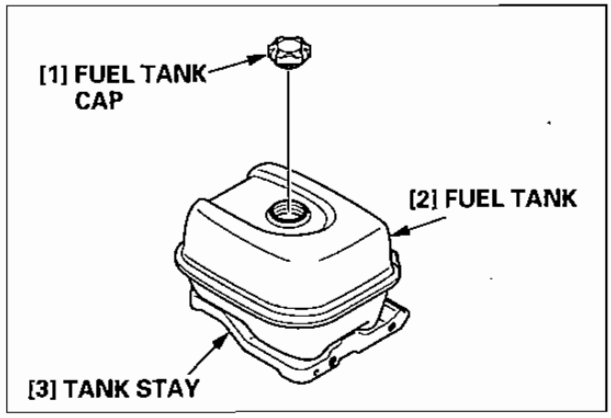
Gasoline is highly flammable and explosive.

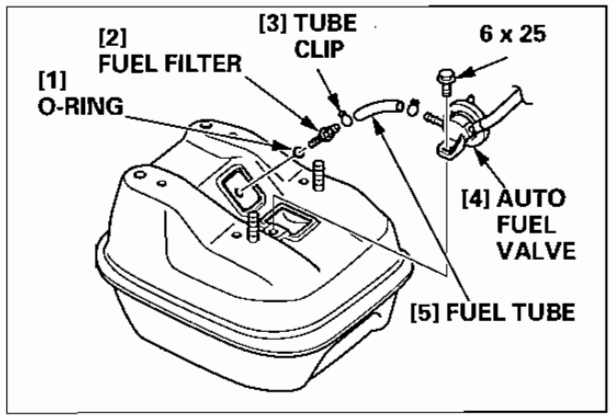
You can be burned or seriously injured when handling fuel.

- Keep heat, sparks and flame away.
- Handle fuel only outdoors.
- Wipe up spills immediately.

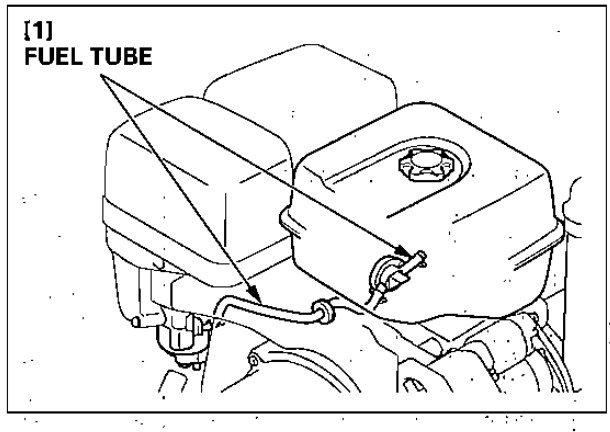
- After connecting the fuel tube, check for any sign of fuel leakage.

1) Drain the fuel from the fuel tank into a suitable container.
   Manual fuel valve type:
   Drain the fuel from the carburetor before removing the fuel tank, proceed as follows:
   a. Turn the fuel valve lever to the OFF position.
   b. Loosen the drain screw of the carburetor and drain the fuel into a suitable container.
2) Remove the fuel tank, tank stay and auto fuel valve (P. 7-1, 2), and disconnect the fuel tube from the auto fuel valve.
3) Disconnect the fuel tube and remove the fuel filter and O-ring from the fuel tank. Wash the fuel filter in nonflammable or high flash point solvent. Inspect the fuel filter screen to be sure it is undamaged.
4) Clean the fuel tank with nonflammable or high flash point solvent and allow to dry thoroughly.
5) Install the fuel filter, O-ring, fuel valve, fuel tube and fuel tank cap. Connect the fuel tube to the fuel valve and install the fuel tank (P. 7-1, 2, 3).
6) After reassembly, check for fuel leaks.





8. FUEL TUBE



Inspection:

⚠ WARNING

Gasoline is highly flammable and explosive.

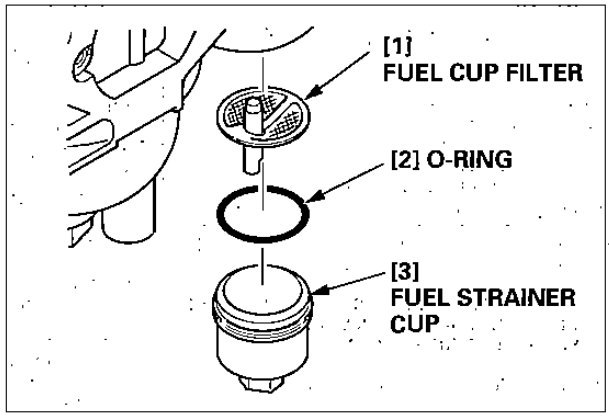
You can be burned or seriously injured when handling fuel.

- Keep heat, sparks and flame away.
- Handle fuel only outdoors.
- Wipe up spills immediately.

- After connecting the fuel tube, check for any sign of fuel leakage.

Check the fuel line for deterioration, damage or leakage. Replace the fuel line if necessary.

9. FUEL STRAINER CUP



Cleaning:

⚠ WARNING

Gasoline is highly flammable and explosive.

You can be burned or seriously injured when handling fuel.

- Keep heat, sparks and flame away.
- Handle fuel only outdoors.
- Wipe up spills immediately.

- After installing the fuel strainer cup, check for any sign of fuel leakage.

1) Remove the fuel strainer cup.
2) Remove the fuel cup filter and clean it.
3) Install the fuel cup filter and tighten the fuel strainer cup to the specified torque.

TORQUE: 3.9 N·m (0.4 kgf·m, 2.9 lbf·ft)